THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXI. No. 2073.] LONDON, FEBRUARY 3, 1903. [55TH YEAR. PRICE 6d.

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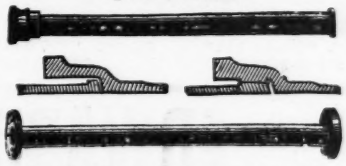

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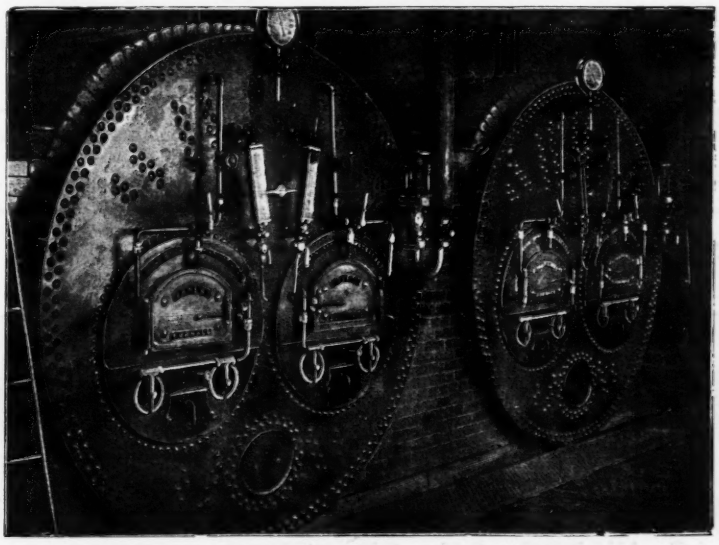

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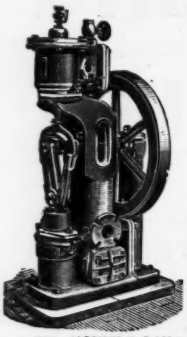

Fig. 705. "SINGLE RAM" STEAM-PUMP.

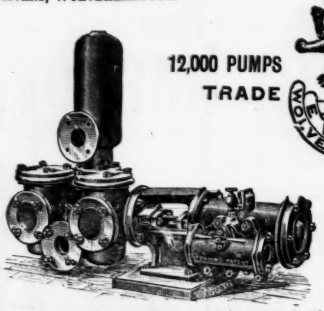

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

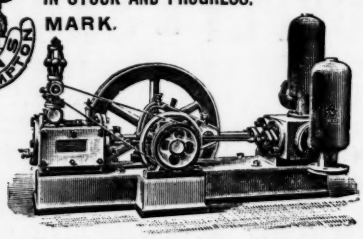

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

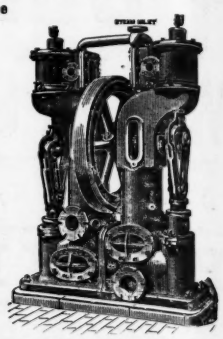

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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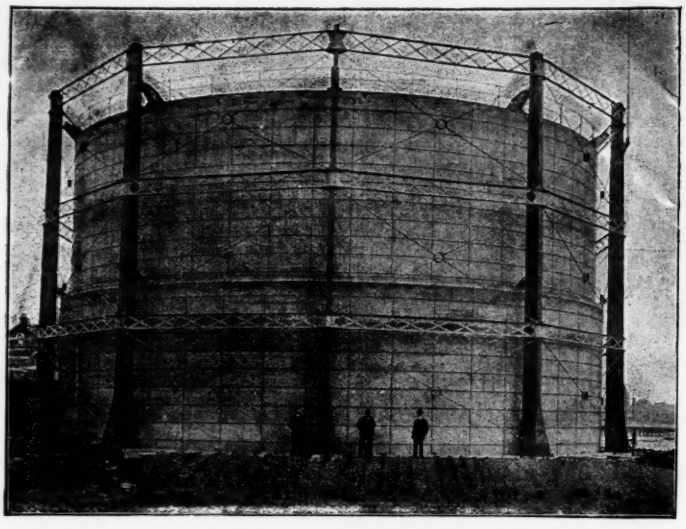

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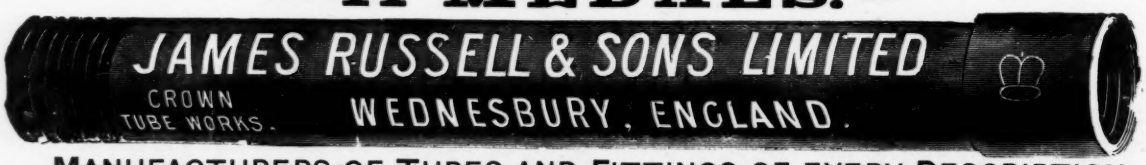

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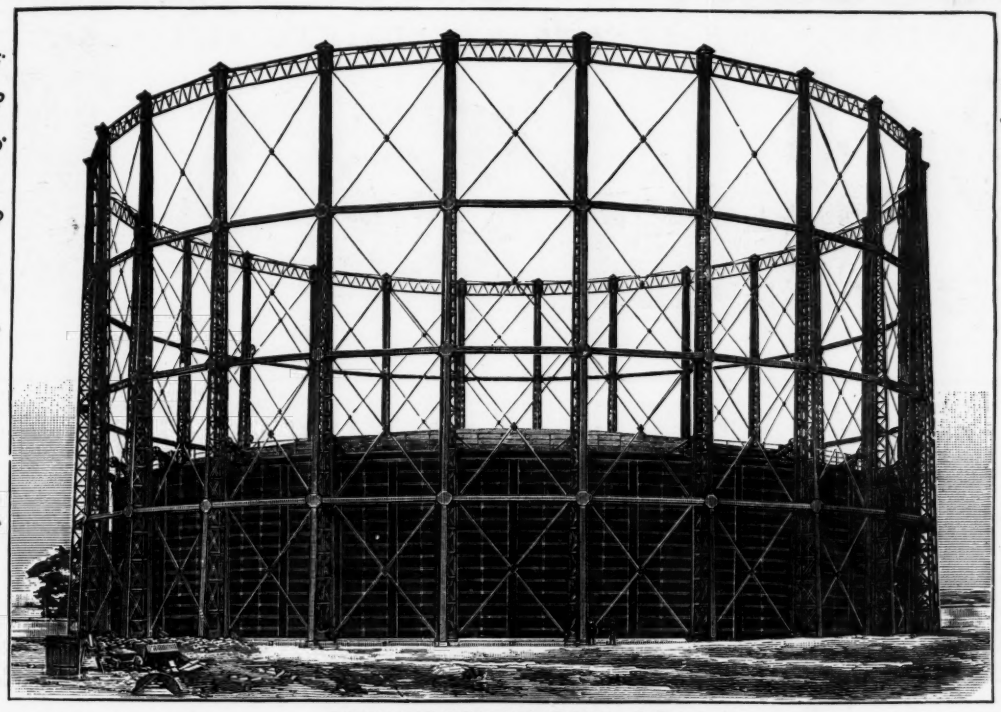

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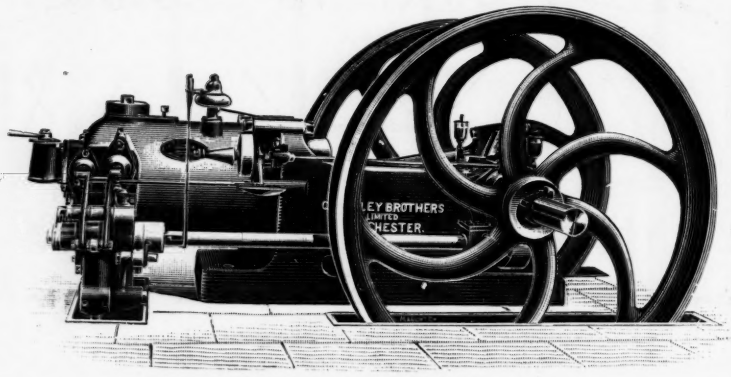

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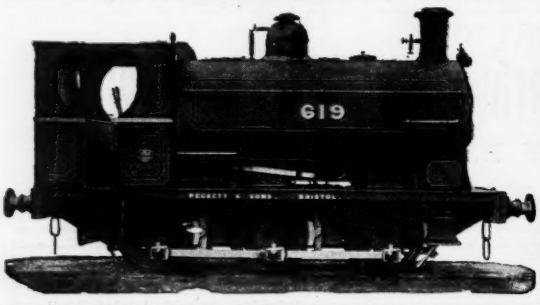

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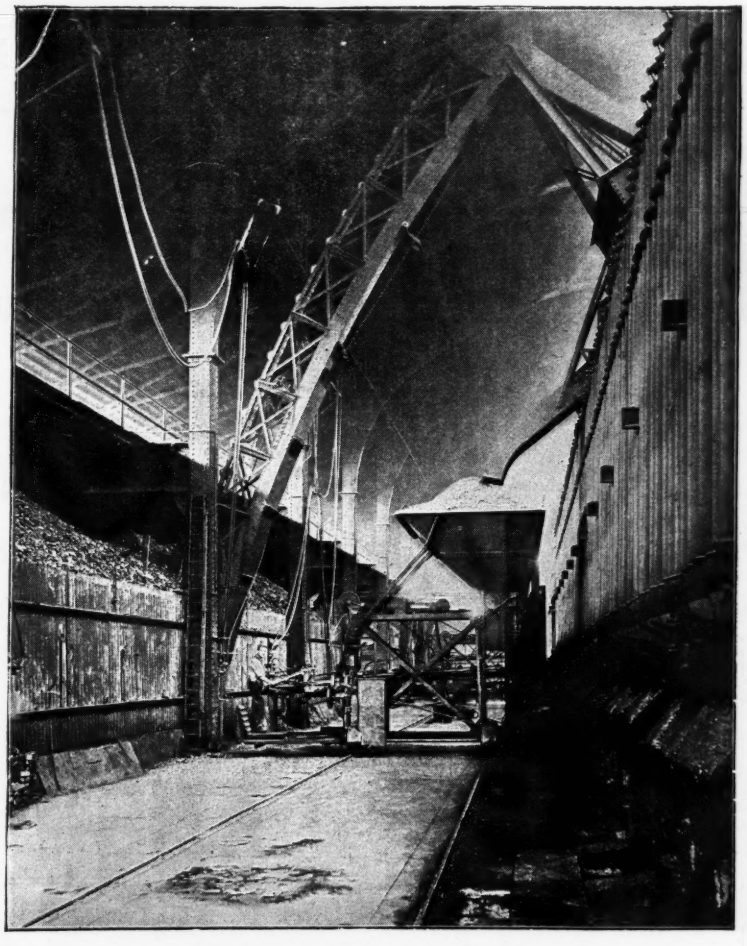

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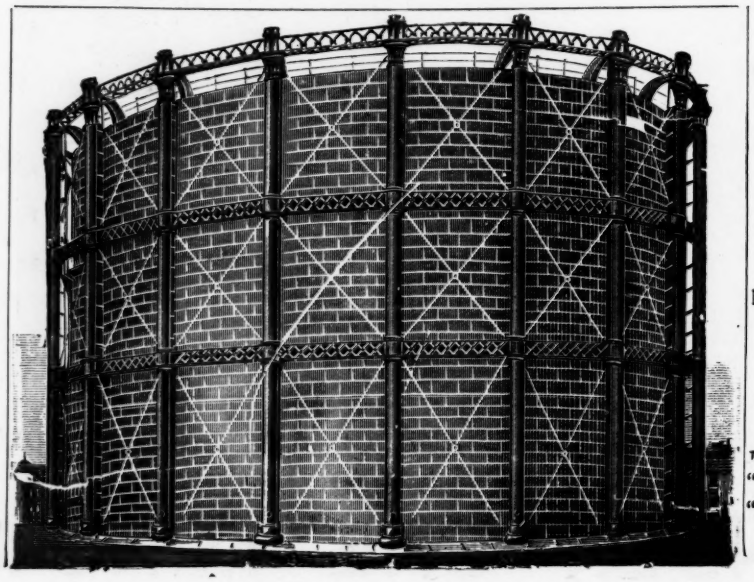

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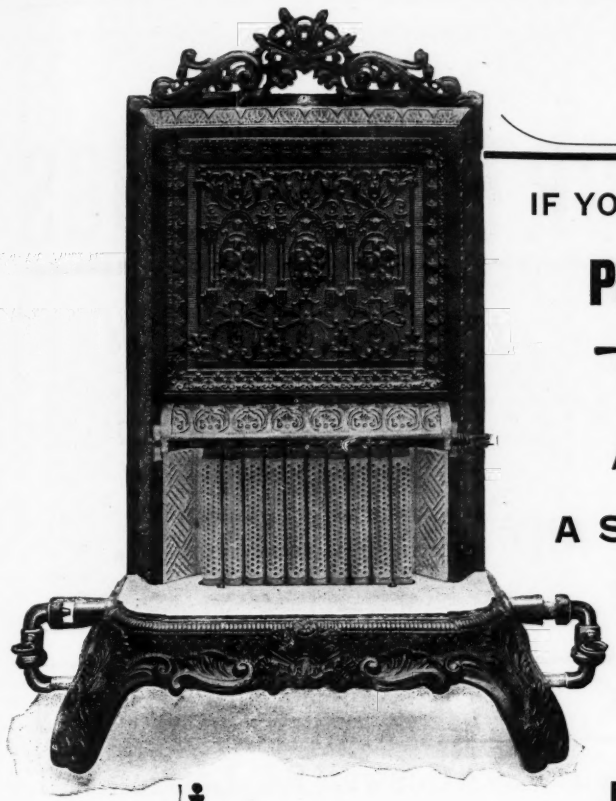

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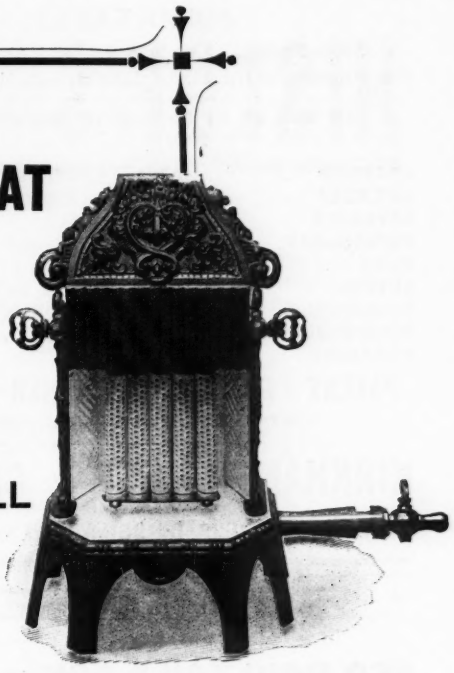

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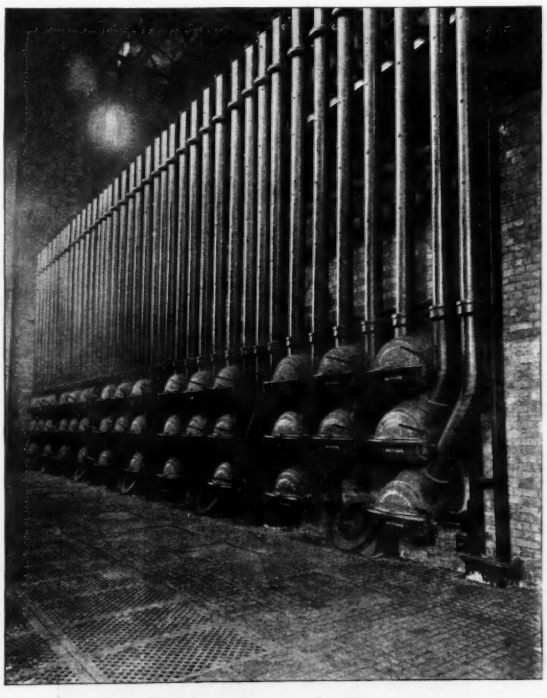

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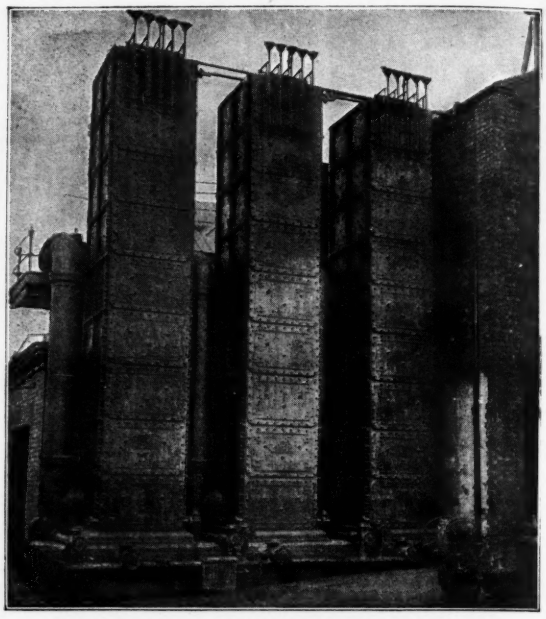

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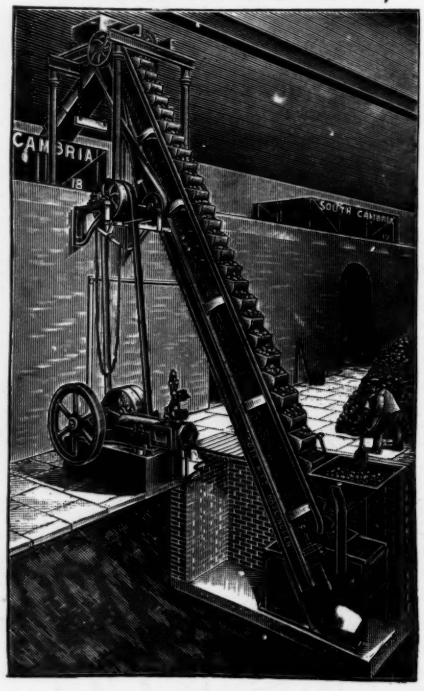

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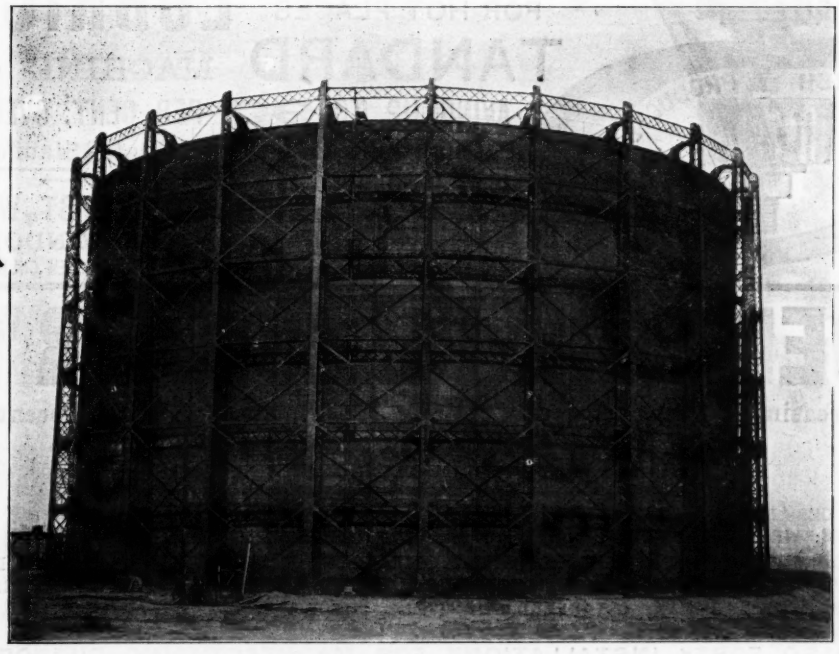

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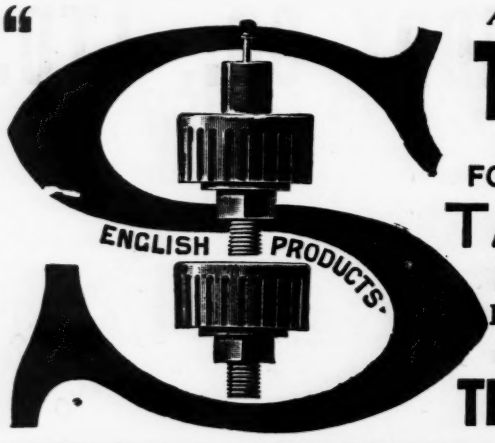

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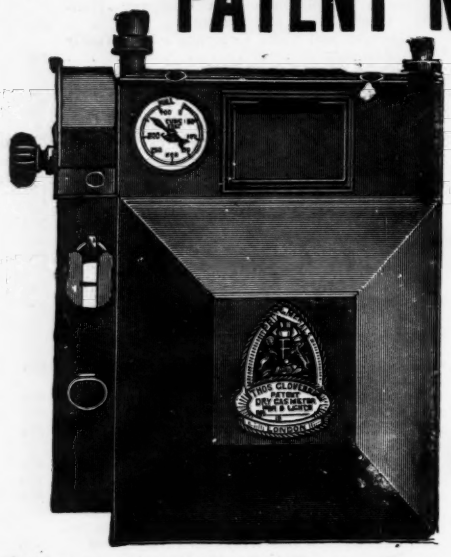

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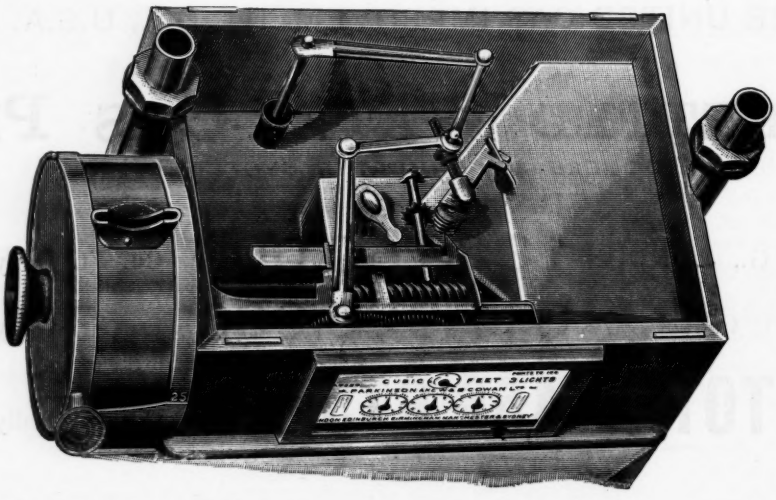

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EDITORIAL NOTES.

The Report and Accounts of the Gaslight and Coke Company.

THE report of the Directors of the Gaslight and Coke Company for the past half year was given in last Tuesday's "JOURNAL;" and the usual statements taken from the accounts accompanying it will be found elsewhere. Interest in both the report and the accounts will be governed by the character of the preliminary dividend announcement, which was to the effect that the Directors would recommend the payment of a dividend after the rate of £4 8s. per cent. per annum. The profit balance for distribution is £400,497; and the payment of the dividend will leave £65,146 to be carried forward to the credit of the current half year, as compared with £64,834 brought forward from the end of 1901. This is very close working. The consumption of gas again showed a decrease, equal to 0·4 per cent. on the sales for the corresponding period of 1901. Owing to various realized economies, the cost of manufacturing gas has been reduced by 4·6d. per 1000 cubic feet, while the net reduction of selling value has fallen 4d. per 1000 cubic feet. The Company are therefore a fraction to the good upon the turn of the revenue. The promotion of the Company's Bill is referred to, and its leading provisions mentioned. Reference is also made to the London County Council Bill to regulate the Company's affairs, which the Directors will be opposing. The report is commendably reticent; the circumstances not favouring a very expansive style of discussing the Company's affairs from within.

Nor is there very much to comment upon in the accounts. The capital account repeats the impressive spectacle of a blank column where the amounts remaining unissued used to appear; but there is still a credit balance of £885,253. Works and mains extensions to the amount of £56,671 went on, and were reduced by sundry credits to £20,628 net additional capital expenditure. The receipts for gas at the reduced price amounted to £1,534,544, as compared with £1,712,942 for the corresponding half of 1901. Stove-rental continues to mount up gratifyingly; and residuals are not so bad. Coke, it is true, dropped from £267,961 to £247,005, which was only what was to have been expected. Ammonia, on the other hand, appears to have touched bottom, and to be on the rise. Altogether, the receipts on the revenue account have come down from £2,145,600 to £1,947,250. On the other side, the cost of the raw materials of gas manufacture dropped from £827,327 to £661,934. The next two entries are particularly gratifying. The Company paid a little more to their Engineers and other officers at the works; and less by about £22,000 for wages. This should mean that the undertaking is at last beginning to feel the benefit of the labour-saving machines that have been on the increase for years in the various works. Repair and maintenance shows a decrease, from £220,817 to £184,481. There is nothing particularly noteworthy under the heading "Distribution of gas," except the cessation of any charge for gas-fittings in connection with antomatic meter supplies. Does this mean that the Company have gone out of this branch of the business? There is still an outstanding amount of £111,918 on this account to be wiped off the books. Presumably, this is being done out of the surcharge upon the prepayment supplies, as it is not charged to revenue, which is quite proper. Rates and taxes, for a wonder, are positively lower. The general expenses exhibit a new and additional entry, of £5000 on account of stamp duty on the increase of nominal capital, under the Company's Act of 1898. This seems a hard bargain. The balance carried to the net revenue account has increased from £499,157 to £525,618. The other accounts are of the usual character. The Company have sold down their stock of coke to a low figure—only 6664 tons. They have lost the supply of nearly 1000 public lamps during the year. The proportion of unaccounted-for gas has been brought down to 4 per cent.

Altogether, the accounts for the last six months of 1902 may be described as favourable in the circumstances. It is satisfactory that the Directors have at last left off referring to the state of the weather as explaining the falling-off in the sale of gas, which is so chronic an experience of the Company. Unless appearances are deceptive, there is but one adequate explanation of the facts, which is that the Company are suffering from the competition of electric light and power, much of it rate-aided, in the inner area of what may be called Old London, and are constrained to spend capital in order to satisfy the demands of consumers on the outskirts. Only recently, moreover, have the Company felt the temporary influence of the increased use of incandescent burners, every one of which is a friend in disguise. They check the consumption at first; but they increase it in the long run, since every incandescent gas-burner that maintains its ground is a challenge to all the electric lamps in the neighbourhood. The Metropolitan Boroughs' competition by selling electric power at less than cost price, as we showed last week to be done in the case of Shoreditch, is a wrong that may have to be made the ground of an application for an injunction if it is not stopped.

Affairs of the South Metropolitan Gas Company. The New Sliding-Scale.

THE report of the Directors and the accounts relating to the past half-year's working of the South Metropolitan Gas Company, which appear elsewhere, are of the colourless character which belongs to institutions enjoying a period of quietly prosperous development. The Company have lived through many years of storm and stress, calling for extraordinary efforts both of defence and of enterprise, and are now reaping the substantial rewards of their successful endeavours. Consequently, the Directors recommend the payment of a dividend at the same rate per annum as in the previous half year—viz., 5⅓, or £5 6s. 8d., per cent. on the consolidated 4 per cent. stock. The amount of profit necessary to pay the dividend has been earned, with £11,177 over. It may not be superfluous to state that the standard price of gas of 14-candle power, which the Company are now under statutory obligation to supply, is 3s. 1d. per 1000 cubic feet, while the selling price throughout the half year was 2s. 3d. per 1000 cubic feet. Under the new sliding-scale, applied in 1900, the amount of variation in the rate of dividend on the stock is 2s. 8d. per cent. for every penny of the selling price above or below the standard of 3s. 1d. per 1000 cubic feet. The actual difference in this case being 10d. per 1000 cubic feet, the consequential extra dividend is ten times 2s. 8d., or £1 6s. 8d., which, as will be seen, it is proposed to distribute by way of increment upon the standard 4 per cent. dividend.

As the report sets forth, although the institution of the sliding-scale dates (as regards the South Metropolitan Company) from 1876, its operation is not generally understood; and the risk of misunderstanding was not lessened by the remodelling of the original settlement which was effected in 1900. A good deal will be heard of this matter in the course of the present year, in connection with the parliamentary business in which the Gaslight and Coke Company are involved; and the same point—the revised scale of dividend and price of gas—will also appear in respect to the dividend dispositions of the Commercial Gas Company, who adopted the same alteration in their Act of last year. There is some reason to think that not all gas people, nor members of local authorities interested in the subject, as yet fully understand and appreciate the new Metropolitan sliding-scale. We have gone the length of stating its effect in the present case of the South Metropolitan Company, in order that such an understanding may be facilitated. One more observation on this head may not be wholly unnecessary. The new Metropolitan sliding-scale, which only applies to gas stocks converted or unified on a 4 per cent. basis, gives 8d. per

cent. more for a penny in the price of gas than the old scale. This addition is due to the recommendation of the Powers of Charge Committee of 1899, who were of opinion that the old scale was not a sufficient inducement to gas companies to really exert themselves to reduce the price of gas. Accordingly, they suggested an additional reward of 2s. per cent. on 4 per cent. capital for every complete 3d. of reduction in the price of gas, which was improved upon by dividing it up into the equivalent of 8d. for every penny, on the ground that the operation would thereby be expedited and made fairer to all parties. Referring again to the South Metropolitan example, it will be seen that, even so, the relative shares of consumers and proprietors in profits in excess of the normal are very unequal, and are greatly to the advantage of the former. It means £56,000 a year to reduce the price of gas 1d. per 1000 cubic feet, and pay the consequential higher dividend; and of this sum, £48,000 is the consumers' saving, and £8000 the shareholders' profit. The respective proportions are therefore as 6 to 1.

A keen observation is made in the report respecting the prospects of the coal market. Although the price of coal was kept up last year, there was no difficulty in procuring supplies during the winter. Thus the necessary condition of a rising market was absent; and, as a result, lower prices are expected this year. As regards the demand for gas in the Company's district, it is remarked that, while there was the "usual satisfactory increase" during the summer months, evidently due to the progressive use of gas for purposes other than lighting, "this was checked by the mild and open "weather of the second three months." It is curious to find this familiar explanation of slackness of trade in this report, after its disappearance from the official message of the Directors of the Gaslight and Coke Company. Of course, the fact exists, for what its influence may be worth in any district. It is really wonderful to learn that the employees' investment in the Company now amounts to £170,000—averaging quite £40 per man. One can safely aver that there is no such wealthy Trade Union in the world; and the men to whom the funds belong can rest assured that not a penny of them will ever be mis-applied after the fashion that has been so notorious of late.

The accounts exhibit every sign of an increasing and prosperous concern. There was an addition of £75,106 to the capital expenditure during the half year; but nothing appears to have been spent on additional land, as contemplated by last year's Act. The revenue from gas amounted to £632,723, against £615,595 for the corresponding half of 1901, with gas at the same price. The numbers of meters, stoves, and fires at rent show a gratifying increase. Coke brought in £168,289, compared with £190,447. Tar and ammonia were both more profitable. The total receipts were £926,679, against a sum of £917,944. Gas manufacture cost £544,165, compared with £602,410. Profit sharing appears for £12,000. There was a substantial reduction of the carbonizing wages—labour-saving machinery implicated. The balance carried to the net revenue account rose from £156,937 to £200,574. The proportion of unaccounted for gas is rather high, at 6·3 per cent. of the make. The speech of the Chairman, Sir George Livesey, may be expected to deal with several matters not mentioned in the report at all, such as the vexatious parliamentary proceedings of the London County Council in trying to upset the settlement of 1900, and also the reckless adventures of the Metropolitan Borough Authorities in electric lighting speculation.

The Denaby Decision.

The Court of Appeal has decided that the Trade Union which has supported out of its funds, and against its own rules, the Denaby strikers, is not legally justified in so doing. This is another sharp reminder to Trade Union managers that they are as amenable to the law of the land as meaner mortals; and it will do them a world of good. By degrees the toils of the law and the power of the British Constitution are tightening round those who fancied themselves "chartered libertines;" and the time cannot be far distant when the Executive of a Trade Union will be as respectable and unadventurous as the Board of a Friendly Society. The peculiar value of the Denaby decision is that it establishes the right of an ordinary subscribing member of a Trade Society to keep the Managers within the four corners of their own rules. This is a thing they have never regarded as incumbent upon them. The Trade Unions have had the most beautiful paper constitutions; and their rules and regulations are very often the admiration of members of debating societies. Unfortunately, in practice, all these theoretical safeguards of the individual rights of members have always vanished before the persuasiveness of the demagogue and the turbulence of unauthorized strikers. Over and over again, as in the Taff Vale case, it has been found impossible for Unions to act upon their own rules and disown "irregular" strikes. Consequently, the Executives have protested—and paid. It was so in the Denaby case. But it will be so no more; for the law of the land has been declared, and the most blatant strike leader must listen. It will take some time for these masterful gentry to accustom themselves to the strange sense of responsibility which recent judgments have made it expedient that persons in their position should possess. Poor Mr. Bell, of the Railway Workers, has already complained most pitifully that the Union branches send only the great talkers, not the best men possible, to serve on the Committees. So long as the employers only suffered from this weakness on the part of Union members, not a single society voice was raised on the subject. Now it has been discovered that a few hare-brained chatterers, suffering from the common Trade Union disease of "swelled head," can run the society into thousands of pounds of indebtedness for nothing at all, the members will be more careful in selecting their executive.

Strange Project of the London County Council.

It will be remembered that one of the points of the report of the Committee which inquired into the question of the possible reform of Private Bill Procedure referred to the representation before Select Committees of interests which, though clearly affected by the proposals of promoters, have not under the existing system any right to appear and be heard. It was suggested that there might with advantage be a relaxation of the strict rules governing *locus standi*, in order that Committees might have all the facts before them. An illustration of the kind of thing covered by this recommendation occurs in the instance of the London County Council (General Powers) Bill. This is the "Omnibus" Bill of the Council for the present year, and it contains a variety of matters, some of which will probably go forward without opposition, while others—such, for example, as the clause to repeal section 6 of the South Metropolitan Gas Act, 1900 (the description of the test-burner)—will have a very different reception. This, of course, is all in the day's work; and doubtless the South Metropolitan Company will be very well able to take care of themselves. The Bill, however, also contains a part which, while fraught with the potentiality of doing more damage to every gas company and many other Metropolitan ratepayers than any project that has engaged the restless activity of the London County Council, does not seem to be open to specific opposition. This is Part XI., entitled "Supply of Electric Fittings "by Metropolitan Borough Councils." It contains two clauses—the first, to unable "the Council of any Metro-"politan Borough, being authorized to supply and supply-"ing electrical energy, to expend money upon the wiring "and fitting and supplying with wires, fittings, and appa-"ratus, the premises of their consumers or prospective con-"sumers," and "to make such charges therefor, whether "directly or otherwise, as they may think fit." The other clause is to empower the Councils to borrow any amount of money they may require for the purpose.

It is hardly needful to dilate on the monstrous character of this programme—deliberately put forward, be it remembered, by the superior financial authority for the Metropolitan area outside the City. Its audacity is enough to make every particular hair of the wig of the Speaker's Counsel stand on end. And this is the same authority that made so much fuss over the amount to be charged by the London Gas Companies for the slot-meter fittings! One may well wonder how much farther the London County Council may go, and yet retain some reputation for administrative sanity. They have not been without warning. The President of the Local Government Board, using the diplomatic mould of language which was probably lost upon an assembly hardened to the oratory of its "corner-men," has had occasion to complain that he did not receive any of the assistance he had a right to expect from the Council in dealing with the difficult problem of the London Water Supply. The Minister will likely have further occasion to use the same

language of dignified censure in respect to the administration of London affairs in general, at the rate the Council are going on the road to universal discredit. The insanity of the present proposal has been happily hit off by an electrical contemporary, which observes that it is "as though a water "or a gas company should put all the pipes and fittings "in a house because they anticipated a customer. . . . "What would be the result? Every speculative builder "would be willing to have his house wired at the expense "of the local authorities, because it would save him so much "expense on capital account. If the house were a loss, "the inevitable mortgagee, who financed the builder, would "have the first charge, and would be able to claim the "wiring and fittings, or at least to prevent their removal." This is not our criticism, but that of a spokesman of the interest intended to be subserved by this piece of administrative madness, who has not quite taken leave of his senses. Besides, what a prospect of favouritism and real jobbery is opened up by the proposal, which does not even suggest that the charges for the accommodation should be remunerative, or that all beneficiaries should be treated alike. With how little wisdom is London governed! The reflection is musty; but the world does not appear to improve in this respect commensurately with its "Progress."

The Press and Labour Questions.

One of the many obstacles in the way of labour and capital becoming better friends, and of the working classes taking more reasonable views of their obligations to their employers, is the fact that the newspapers most generally read by those classes and by their leaders appear to be either incapable of realizing that workmen who go on strike are not necessarily suffering from genuine grievances, and that employers are not necessarily tyrants whose one sentiment towards their employees is that of determination to wring from them the last ounce of labour for the least possible wage, or else they resolutely refuse to admit these facts in their columns for fear of giving offence to their readers. Nothing is more calculated to confirm both leaders and followers in their unreasonable attitude towards the capitalist classes than this indiscriminate support in all their actions, regardless of the merits of the case, by these so-called "organs of public "opinion;" for it is obvious the comparatively ignorant man is less likely to value such support at its true worth, and that the comparatively poor man is less likely to provide himself with the means of hearing both sides, than is the educated and well-to-do employer who mixes with numbers of thoughtful and well-informed men, whose occupation does not involve the employment of labour, and who are consequently able to form and make known to the employer an independent opinion upon the broad questions at issue between capital and labour. The true friend to the working classes would be a newspaper which, while displaying warm sympathy with their aspirations and needs, would take occasion to put before them facts of which they are ignorant or careless, but which have to be taken seriously into consideration by the employers on whose prosperity they are largely dependent. Such a paper, unfortunately, is yet to seek.

We are moved to these remarks by a conspicuous instance of this determination on the part of certain journals to see right only upon the side of the working classes which has come under our notice in connection with the Denaby strike, and the action arising out of the granting of strike pay by the Yorkshire Miners' Association to the men who struck work contrary to the rules of the Trade Union. The "Daily "Chronicle," in commenting on the judgment of the Court of Appeal—which showed that the men had been acting illegally throughout—instead of pointing out to the men the obvious moral that they have their obligations as well as their rights, and should remember the one as well as the other, merely dismissed the subject, as regards the action of the men, with the remark: "That being so, the grant of "strike pay was illegal." It then proceeded to blacken the employers in the minds of its readers by saying: "But "the masters have alienated public opinion"—what steps did the writer take to ascertain the state of public opinion?—"by the harsh use which they made of their position as "landlords, and by their refusal of Lord Justice Vaughan "Williams's proposal of a compromise. . . . The con-"clusion which the public has formed of the matter is that "the men acted in the first instance with indiscretion, and "that their employers have been acting ever since with "ruthless severity." We say without hesitation a greater slander upon an employer of labour was never put forward in a newspaper of respectable standing, and that, so far from the public having formed the conclusion which a writer evidently hopelessly ignorant of the facts has put into their mouths, every intelligent person who has studied the history of the case has necessarily arrived at the conclusion that there never was a more senseless strike, and that more humane and reasonable employers it would be difficult to find.

Could any greater travesty of the truth be conceived than to state that employers who, for six months after their men struck work (for no good reason, and contrary to the advice and rules of their Union), allowed those men to remain in the houses belonging to the colliery without paying rent—thereby preventing any other men who might be willing to work from coming to the neighbourhood to do so—could be charged with having made "harsh use of their position as "landlords," and as having acted from the first "with ruth-"less severity"? Supposing half of the composing staff of the "Daily Chronicle" were provided with living-rooms on the premises, how many months would the proprietors allow those men to occupy such rooms rent free if they had struck work? Would they consider themselves bound to let them remain there indefinitely, or would they be so ruthless in their severity as to evict them as "quickly" as the Denaby Colliery turned out their men? We rather fancy it would not be a question so much of months as days. Really, such ignorant and hopelessly prejudiced comment upon labour matters by a newspaper that aspires to inform the opinion of one of the two great political parties in the State, makes those who are anxious for the establishment of more amicable relations between employers and employed despair of the possibility of any progress towards such a consummation. When the blind essay to lead the blind, both are likely to fall into a ditch.

The Prices of Thorium and Mantles.

Twice recently attention has been called in these columns to the fact that thorium has fallen almost completely under the domination of a Trust, who have full control of the present source of monazite sand, from which thorium is extracted. The formation of this combination, as some German correspondents lately informed us and readers, has already had its first effect in increasing the price of this prime article of mantle manufacture. From another German firm, we learn that this rise in price is only a beginning, and that mantle makers may expect further additions to the demands of the Thorium Trust. There is, indeed, no cheap thorium now on the market; and lucky are those mantle manufacturers who have any low-priced contracts running. There is ample ground for the remonstrance that was recently made against this and another rumoured combination in the mantle trade. It is true that the increase so far made in the price of thorium does not in itself represent more than a fraction of a penny per mantle for production; but the end is not yet. Gas companies do not buy by the mantle nowadays, but in considerable quantities; and we have it that one large firm of mantle importers—there may have been more—last week put up their prices, solely on account of the increase in the price of thorium, 10s. per 1000, and £1 is being talked about. This looks something like the thin end of the wedge, the insertion of which in other matters, experience has shown most people, it is well to resist when their own interests are threatened. Gas companies, too, are not the only people who buy in the bulk. There are the retailers; and any increase in price to them will, in the ordinary course of things, be promptly and profitably visited upon the private users. We do not suppose that retailers of incandescent gas mantles take a loftier view of their dealings with the public than retailers of (say) coal and food-stuffs, who, the householder is often reminded, take a very generous view of what is a fair tax on consumers for any additional charge they are themselves called upon to pay at first hand. But the main point at present is this, that there is no reason for the increase in the price of thorium, beyond that of the voracity for greater profits of the men forming the Thorium Trust. That seems to be the sole object of their combination. They have already shown their power, and proved that thorium can be controlled. The question now is, Where will it end? Regarding the proposed mantle-makers' combination (in connection with which certain gentlemen from England a

few weeks since visited Germany), our latest information is that the negotiations are not yet settled. How much is this combination proposing to add to the increase in the price of mantles that the Thorium Trust are bringing about?

The Oil Market.

THERE appears to be something mysterious about the influences that govern the ruling prices of petroleum in the United Kingdom. Russian oil, by all accounts, is being poured into this country in an ever-increasing volume, notwithstanding the fact that the native output is being restricted, and that last year was a very rough time for the English companies doing trade in Russian oil. Still, the Russian importation has not overtaken the American, which holds its own notwithstanding the higher price. It is stated in the "Petroleum Review" that American—that is to say, Pennsylvanian—crude oil is now worth 3·34d. per gallon; while the refined burning oil sells in England at rather more than 6d. per gallon. Russian crude is stated to be worth no more than ½d. per gallon at home; while the refined product commands about 4¾d. per gallon here in England. There is thus a huge inequality, which must assuredly mean something. So far as the English market for lamp oil is concerned, there should be a final cessation of the silly talk in some quarters about this country being the dumping-ground for the refuse of the Standard Oil Company, in the shape of "low-flash" oil. If people will pay about 1½d. per gallon, or almost 30 per cent., more for ordinary American oil than they will for Russian oil, the fact is one that seems to demand another explanation than the one suggested by the philosophy of the London County Council. But there is for the gas industry another message in these figures. Gas oil is of both American and Russian origin. In the case of the former, the crude oil from which it is separated is worth 3·34d. per gallon, as against ½d. per gallon in the latter case. What ought to be the relative prices of gas oils in these instances, also having regard to the respective quotations for imported refined? It would be impossible to say, with any reasonable approximation to the truth, which means that the market is an entirely artificial one, where the seller gets as much as he can, and the buyer drives the best bargain permitted by his needs, without either party knowing exactly how it stands in relation to what might be called intrinsic value, if such a thing existed.

The Work of the Sulphate of Ammonia Committee.

The Sulphate of Ammonia Committee have issued their report on the results of the agricultural competitions conducted under their auspices during the season of 1901. It is signed by their expert, Mr. John Hunter, who presents a valuable record of useful work, which is now not only experimental but consultative, of a highly complex nature, and of considerable volume. This will be evident from the statement of Mr. Hunter that questions of every description in regard to the treatment of soils—even including sugar-cane land—and the manures to be applied to crops have to be answered. These matters necessarily require the utmost care and attention, as one mistake might result in more damage than could be counterbalanced by a dozen successes; and the manner in which they are dealt with is shown by the fact that not the slightest suggestion of disappointment has been made from any quarter. No better proof could be afforded of the value of the assistance rendered by the Committee than the anxiety now exhibited by Agricultural Associations in many parts of the country to be included in the lists of those who are favoured by grants from the Committee, and also the large increase in the number and nature of the inquiries. With regard to the special subject-matter of the report, Mr. Hunter says the experiments completed in the period covered are again extremely gratifying, showing as they do in every class "great weight of crop, excellent quality, and conspicuously good keeping properties." Indeed, it must now, he states, be accepted as a fully established fact, that "no other manure of its class can for one moment compare with sulphate of ammonia in all these respects." The Committee printed no less than 50,000 copies of their report for 1900, and 10,000 of them were taken by subscribers for circulation in their respective districts. The rest, with the exception of about 5000 held in reserve, were all distributed over the United Kingdom. The report just issued will, no doubt, be similarly dealt with. The dissemination of this mass of information in regard to the capabilities of a manure in the production of which the conductors of gas undertakings are so largely interested cannot fail to stimulate demand for it; and therefore it may be hoped that the conspicuous dearth of sulphate which Mr. Hunter regrets to record as prevalent towards the close of the sowing season of the past year may not lead agriculturists to resort to inferior sources of nitrogen, to its detriment. This is a matter which the Committee are watching very closely.

Explosions in Electric Light Boxes.

The phenomenon of the leakage of gases from mains is one which is encountered almost daily by every gas engineer in the kingdom, and many disasters from explosions have happened as the result, in some instances, of defective joints. These explosions have been due to escapes of gas finding their way into the electrical conduits, and there becoming ignited. In addition to these sources of danger, we now have electrical companies generating their own explosive mixture of gases from ignited cables, due in most cases to faulty and defective insulation. The gases thus liberated are a homogeneous mixture. In other words, the burning bituminous insulating covering will probably generate explosive gases by direct heat, and carbon monoxide by imperfect combustion in the presence of vitiated air. What we should expect to find in the electrical conduit chambers would be a mixture of carbon monoxide, carbon dioxide, light hydrocarbon gases, and heavy bituminous gases. The last-named gases will not of themselves pass away into the atmosphere by virtue of their specific gravity alone; whereas if the vertical upcast shaft system of ventilation were provided, they would be readily removed. In Glasgow, Falkirk, and St. Pancras this system has been adopted. It has been suggested as a remedial measure that a circulatory system of air throughout all electrical conduits should be employed; the air being aspirated by means of fans and upcast shafts. This system, however, is liable to several vitiating effects, the principal one being that there is a strong probability that the suction created by the fan would draw into any existing conduits gases escaping from the mains, and thus increase the danger element of explosion. If, then, sufficient suction—or shall we call it sufficient intake?—be provided with this system, there can be no possibility of coal gas being aspirated into the conduit. That is to say, if the fan is given sufficient intake and sufficient outlet, no coal gas will find its way into the conduits except by some extensive leakage, with which it is the duty of the gas engineer to deal.

An Auditor and Some Hotel Bills.

The question of what is a "reasonable allowance" for the hotel expenses of the members of municipal corporations and officials during absence from home on deputations, had some light thrown upon it in the course of a recent case in the Irish King's Bench Division. This was not, however, the problem directly before the Court; the action being one brought by some of the members of the Belfast Corporation to quash certain disallowances of the Local Government Board Auditor when auditing the accounts of the Municipality. The members of the Corporation charged £1 11s. 6d. each per day while out of Belfast on the business of the city. But Mr. Newell, the Auditor in question, struck off 10s. 6d. of this amount, and surcharged the sum thus represented (nearly £100) against the members who signed the cheques. The figure charged had hitherto always been fixed by the Council as the proper one for hotel expenses; and it had been allowed by former Local Government Board Auditors. Mr. Newell, on the other hand, maintained that £1 1s. a day was the maximum allowed in the case of any other public body of the kind in Ireland; and he said he was not aware of any authority which would entitle the members or officers of the Belfast Corporation to claim or receive more. In the course of the hearing, it was stated that the daily allowance of the Lord Provost of Edinburgh was £3 3s., and of members of the Council £2 2s.; the Lord Provost of Glasgow received £3 3s. a day, and councillors £1 11s. 6d., while in Liverpool the amount was £2 2s. a day, in Plymouth £1 11s. 6d., and in Bradford £2 2s. The question the Court had to decide, however, was not one of reasonableness, but whether the Auditor had jurisdiction to determine that

the amount paid for a legal purpose was unreasonable or exorbitant, and to disallow the excess. The Lord Chief Baron, in giving judgment, said that the Corporation Acts allowing the expenses of officers, &c., to be fixed by the Council did not apply in this instance, and that the Auditor had jurisdiction to decide what was a reasonable allowance for hotel expenses. It was not pretended that any statute fixed the actual sum; and therefore the only amount legally allowable was a "reasonable" one. But what was a reasonable sum, was a matter of fact which the Auditor himself must decide. If the Auditor had no jurisdiction to determine whether the scale of payment fixed by the Corporation was a reasonable one, the audit of municipal accounts would be divested of half its value. His Lordship was particularly careful not to express an opinion himself as to what would constitute a "reasonable" charge; but this does not matter. The Auditor has fixed it at £1 1s. a day; and presumably future municipal deputations from Belfast will have to house and feed themselves more economically than has hitherto been the custom. The joy which the ratepayers should feel at this decision will, it is to be feared, be greatly tempered by the fact that both parties are to be allowed their costs out of the rates. A good many half guineas will have to be saved in order to wipe off the law charges in connection with the action.

Maidstone Gas Company and the Recent Explosion.

It is greatly to be regretted that the "sweet reasonableness" shown by the Directors of the Maidstone Gas Company with regard to the liability for the recent fatal explosion on Maidstone bridge has so far not been reciprocated by the Corporation. If ever there was a case in which a friendly settlement would be advantageous to both parties, surely it is this one. If the matter was decided by the Law Courts, and the Corporation were found liable, the inhabitants, as ratepayers, would have to bear the cost; while if the Company were condemned, the same people, as gas consumers, would be compelled to pay. This is so obvious, that it is impossible to believe other than that the Corporation will in due course seize the olive branch which has been so frankly held out to them by the Company. But, whatever may happen in this regard, it cannot fail to be a great satisfaction to the latter to feel that they have done everything in their power to come to an agreement; and, if litigation should arise, it would undoubtedly be a strong point in their favour to be able to say that they strove hard, though in vain, to arrive at an amicable settlement with their opponents. This would throw the whole of the responsibility for the legal proceedings upon the Corporation; and they would need to have a very good case indeed to justify their attitude. But is all the right of the matter on their side? It may be true that, if the gas had not been present, there would have been no explosion. But at an extraordinary meeting of the Company held last week to consider the matter, the Chairman (Mr. G. Marsham) pointed out that other conditions were necessary to the accident; and for these the Corporation were responsible. In the first place, the bridge was not ventilated; and, secondly, the cavity which existed in it had not been filled up. Another very important point is that, though notice was, on the evening of the explosion, sent to the electricity works that smoke was seen coming from below an electric arc lamp on the bridge, no steps were taken to put out the light. In view of these facts, there does not appear to be any justification for the Corporation refusing to discuss the matter with the Company; and it is therefore to be hoped that wiser counsels will prevail with them. Meanwhile, it is a pleasure to note that the sufferers by the occurrence will, owing to the generosity of the Directors, not be the losers by the attitude taken up by the Corporation. The whole conduct of the representatives of the Company in connection with the catastrophe is worthy of all praise; and whatever may be the final result of the dispute, they will certainly have nothing with which to reproach themselves.

The Gas and Water Bills Numerically Compared.

In number, the Private Bills bearing in any way on gas and water supply that have been introduced for the coming session, fall short of those promoted in the session of 1902. All-told there are only 58 measures, whereas last year the list reached 69. But the loss is entirely in Water Bills; seeing that in connection with gas matters there are 38 applications this year as against 30 last session. The number of gas companies seeking incorporation is practically the same. There are seven of these concerns proposing to submit themselves to special statutory control and to extend their powers, as against six in 1902. But existing statutory companies to the number of twenty are asking for further powers, as compared with fourteen. Local authority Bills dealing wholly or partly with gas run about equal. There are nine this year in comparison with ten last session. Dissecting the nine, it is found that five refer to the acquisition of gas companies' undertakings, which is one more than last session. In the balance of the local authority measures for the coming session are included two by the London County Council. Of the other two measures making up the 38 in which gas undertakings are concerned, one deals with power gas, and the other provides for the transfer of the electricity undertaking of the Walker and Wallsend Gas Company to the Newcastle Electric Supply Company. Measures dealing entirely or partly with water have had a tremendous drop. There are only twenty proposed for consideration in the coming session, as compared with 39 last year. Of the twenty, only three refer to companies' undertakings; the remaining seventeen all emanating from local authorities. The proportion last session was 14 companies to 25 local authorities; so in both directions in the water line there is a substantial relapse.

An Important Point for Gas-Engine Users.

The paper read by Mr. H. B. Graham, at a recent meeting of the Birmingham Section of the Institution of Electrical Engineers, on "Gas-Engines for Electric Lighting," dealt mainly, as will be seen by the abstract which appears in another column, with constructional and working details. At the same time it contained towards the close some pointed references to a matter of considerable importance to users of gas-engines and those who furnish the fuel employed in driving them—viz., the calorific value of gas. In selecting an engine, the chances are that the buyer or his adviser will be influenced mainly by the low consumption of fuel required for driving it; yet, as Mr. Graham showed, the saving of half a cubic foot of gas per brake horse power at the cost of an initial outlay one-fifth higher, which sometimes is the result, is false economy. What the user should really consider first is the heat-giving power of his gas—its capacity to do a certain amount of work, rather than to afford the light of a given number of candles; for, as was pointed out, two gases, each of the same illuminating power, may differ as much as 25 per cent. in calorific value. The low-power gas, therefore, which is now gradually coming into use, will be more serviceable in an internal combustion engine than gas of the high photometric quality which managers generally are compelled to supply at so much additional expense. Mr. Graham was addressing a number of electrical engineers, and he showed how very important this question was to them, seeing that the price per unit of current generated depends upon the cost per calorie of the heat employed in the prime mover. Consumers are gradually beginning to appreciate the fact that it is the heat unit of the gas about which they must concern themselves, whether they employ the commodity for lighting, cooking, or motive power; and they will see that they get it.

Burning-Off Mantles.

It will be remembered that Professor Lewes, in the course of the third of his recent series of Cantor Lectures on the "Future of Coal Gas and Allied Illuminants," at the Society of Arts, referred in highly appreciative terms to an automatic process of burning-off and shaping mantles invented by Herr Buhlmann, of Berlin. This machine ensures, in the most simple and effective manner, uniformity in the condition of the ash, as well as in the shape of the mantle; and a mantle treated by it which was tested by Professor Lewes, burnt for over 3000 hours without any decrease of the initial illuminating power—*i.e.*, 60 candles, for a consumption of 4 cubic feet of gas at a pressure of 12-10ths. How much longer the mantle would have gone on in the same way, it is impossible to say, for at the end of the period mentioned it was accidentally broken in removing a cracked glass. Though this mantle contained a rather higher proportion of the oxides than those in ordinary use in Berlin, Professor Lewes said he was inclined to believe that the marvellous increase in life shown by this test was largely due to the method of burning-off adopted. We are this week able to give an illustration of

Herr Buhlmann's device—it is one of several which accompanied a paper on "High-Power and Other Incandescent Gas-Burners," read by Dr. H. Drehschmidt at the last meeting of the German Association of Gas and Water Engineers—which shows clearly the method employed by the inventor for the attainment of his object. Dr. Drehschmidt also gives at the end of his paper a short, but lucid, description of the arrangement which he says has now passed the experimental stage—it being employed for burning-off the whole of the mantles made at one of the factories in Berlin. Additional interest is lent to this invention by the fact that in Germany gas undertakings are at the present time going in largely for burning-off their own mantles; and the practice is one which is likely to grow.

The Institution and Midland Meetings.

Arrangements have been made by the Council of the Institution of Gas Engineers for the convening of the members for the statutory meeting on the afternoon of Thursday, Feb. 26; and, by the kind permission of the Council of the Institution of Mechanical Engineers, it will be held in the fine lecture theatre of the new premises at Storey's Gate, St. James's Park. It will be seen that the date fixed clashes with that already announced for the Midland Association meeting; but the circumstances are such that the Institution meeting could not well be moved to another day. Immediately the collision of the dates was brought to the notice of the President-Elect of the Midland Association (Mr. Charles Meiklejohn) and the Hon. Secretary (Mr. A. Cooke), they took the necessary steps to ascertain whether their meeting could be postponed to the following Thursday—March 5. It is not expected that there will be any difficulty in effecting this change in the arrangements; but members will, in due course, be notified as to the final determination of the Committee. Notices as to the Institution meeting will also be sent out to the members in due course.

WATER AFFAIRS.

The Quality of London Water Last Year.

THE report presented by Sir William Crookes and Professor Dewar to the Official Water Examiner for the Metropolis for the last month of each year possesses special interest from the fact that these distinguished chemists include in it some statistics showing the results of their examination of the water supplied to London during the twelve months. In the period lately closed, they made 2570 chemical and 6953 bacteriological examinations of the water—a total of 9523 tests; and it is in the highest degree satisfactory to find them recording that the standard of general organic purity, as defined by chemical methods, was maintained. For some reason or another, bacteriology seems to have gone quite out of favour at the Local Government Board during the past few years, as no mention whatever is made of it in their annual reports. Yet Sir William Crookes and his colleague say that the greater experience they have of the bacteriological method as applied to the analysis of filtered water, the more firmly are they convinced of its "primary importance as a safeguard to the public." They point out that it enables them to define, in a much more delicate way than is possible by chemical analysis, what is an "efficiently filtered" water; and consequently it places a chemist in the position of being able to warn a water engineer the moment any one of his filters shows signs of defective working. They consider that the variation in the quantity of organic matter in solution in water according to the season of the year is of relatively small importance in comparison with the knowledge that the microbic impurity is reduced to a minimum. Let us see how London water came out last year under the application of this method of examination. In the first six months, the clear-water wells of the Companies drawing from the Thames contained on an average 29 bacteria per cubic centimetre; while the New River and Lea supplies contained respectively 12 and 21. During the latter half of the year, the numbers were 26, 14, and 29. The means for the twelve months were 27, 13, and 25. These figures are rather higher than those for the preceding year, but very considerably lower than the averages for 1897, which were 46, 32, and 62. Dr. Koch, it will be remembered, considered that efficient filtration had been secured if the effluent water did not show more than 100 microbes per cubic centimetre—a standard of purity adopted by the late Sir Edward Frankland, and one which Sir William Crookes and Professor Dewar regard as a good limit. Sir Edward was careful, however, to let it be clearly understood that the infraction of this standard was not to be taken as justifying suspicion in regard to the wholesomeness of a particular water. We think the most ardent detractors of London water will be satisfied with the figures given by the unimpeachable authorities named.

An Unfounded Charge Rebutted.

THE advisability of suspending judgment until both sides have been heard has never been better exemplified than it was last week by two incidents at the Southwark Police Court. The Senior Surgeon and House Visitor of the Royal Eye Hospital in St. George's Circus (Professor Malcolm M'Hardy) attended before Mr. Paul Taylor, the sitting Magistrate, on Thursday, and made a long series of charges against the Lambeth Water Company which, on the face of them, justified severe condemnation of the officials. Here was an establishment which had been constructed, so far as the water-supply arrangements were concerned, strictly in accordance with provisions laid down by the Company, not only deprived of water for the necessary sanitary purposes, but also for supplying the boilers furnishing heat to the different parts of the building. This happening during the prevalence of the severe weather about the middle of last month, and with the hospital full of patients, naturally caused great inconvenience to the staff, to which was added the vexation of having, as was stated, their appeals to the Company treated with supreme indifference. Fortunately, their neighbours, the Fire Brigade of the London County Council, came to their assistance, and, with the help of a steam fire engine, filled the tanks from a street hydrant. This enabled the work of the hospital to be carried on till the Company's supply arrived. A similar state of things occurred on the day previous to the application; but to Professor M'Hardy's telegrams "no "heed or no effective attention" was given. In the evening, however, water did make its appearance. This, in brief, was the story he told the Magistrate; and he appealed to him for advice as to whether the hospital authorities had any summary remedy against the "powerful but negligent public "Company," whose almost "criminal conduct" might at any moment be "fraught with the gravest consequences to the "institution and its inmates." Mr. Taylor did not hold out any promise of help, but he expressed the hope that the Press would notice the matter. This they did not fail to do to the fullest extent; and result was to create a scare, coming as it did only two days after the terrible fire at the Colney Hatch Lunatic Asylum, the destructive effect of which had, it was at first reported (erroneously, as it now appears), been due in a large measure to an inadequate supply of water.

A very different version of the affair was, however, presented to his Worship the next day by Mr. Pasmore, the Company's Solicitor. He stated that, as a matter of fact, no complaint was received at the office till the afternoon of the 28th ult., when directions were immediately given to the foreman to investigate the matter. On going to the hospital he found that the stopcock on the supply-pipe had been shut down by somebody not in the Company's service, and the water thus prevented from passing from the main, which was charged under statutory pressure, into the building. As the Company are not responsible for either the pipe or the stopcock, the inconvenience complained of was not due to any default or negligence on their part, but to what, in the words of the complainant, may be characterized as "criminal "conduct" on the part of someone, who may possibly have to appear before the Magistrate to answer for it.

We agree with his Worship that, if the whole of the facts had been in the possession of Professor M'Hardy, he would not have made his application. At the same time we consider that it was his duty to obtain them—if necessary, by personal investigation—before presenting himself at a Police Court, and enlisting the services of the Magistrate to punish, and of the Press to bring "the force of ridicule and contempt" upon, a public Company on an *ex parte* charge of neglecting

their duty. Such an investigation, it seems to us, he was specially qualified to carry out; for, if we remember rightly, he has known the building, in Gilbertian language, "from "a babby." It was erected in accordance with his suggestions, and therefore he must be better acquainted with the details of its water-supply arrangements than an ordinary Senior Surgeon or House Visitor would be. If, therefore, when the water trouble came before him, he had diagnosed the case with the accuracy which is a conspicuous feature of his professional work, we think he would soon have found the cause of it. We are aware of the intense interest he takes in the excellent institution which has been established under his supervision in St. George's Circus; and we can understand him feeling annoyed at anything occurring to interfere with the comfort of the inmates. But when this unfortunately happens, he should be careful to put the blame on the right parties. We trust, after the full explanation the Lambeth Water Company have made, he will frankly acknowledge that in the present case it has been misplaced; but, whether he does so or not, they have obtained for their explanation the same publicity that was given to the statement which rendered it necessary.

North Warwickshire Water Arbitration.

THE issue of the award (which will be found in another part of to-day's issue) in the recent arbitration to determine the price to be paid to the North Warwickshire Water Company by the Coventry Corporation for a portion of their undertaking, affords us an opportunity of calling attention to the points in regard to which this case differs from the usual run of gas and water arbitrations. The principles upon which the value of such concerns is determined are now so well understood that, in proceedings regarding the transfer of private works to public bodies, the differences between the parties turn mainly upon the questions of prospective increase of net revenue, outlay for additional works and improvement of supply, the number of years' purchase at which income should be capitalized, and the accuracy of the accounts. Thus it is becoming somewhat of a rarity to come across anything of a novel or exceptional character. It is true that from time to time attempts have been made to introduce the principle of estimating the value of an undertaking upon the structural worth of its works and mains; and it will be remembered that such an idea was extensively promulgated when the London County Council were endeavouring to obtain power to purchase the Water Companies. It is, however, in the highest degree unlikely that such an unfair proposal will ever be acted upon. Apparently the Coventry Corporation had some idea of applying the "structural value" principle to the portion of the North Warwickshire Water Company's undertaking which they were intending to purchase; but the Arbitrators, in deciding that Counsel for the Corporation were not entitled to inspect the contract under which certain works were carried out, effectually put an end to this "day dream."

From the special report of the arbitration proceedings which appeared in the "JOURNAL" for NOV. 18 last, it will be seen that the Coventry Corporation, under the Company's original Act of 1898, obtained power to purchase, not the whole undertaking, but only so much of it as might be included within a certain area which the Corporation contemplated adding to the limits of the city. This extension took place last year; and by it the growing districts of Foleshill and Stoke were brought within the city boundaries. The arbitration was therefore held to determine the amount of compensation to be paid to the Company for the loss of the present and prospective water-rental—the latter period being, however, expressly limited by the Act to the year 1910. The clause under which the proceedings arose stated that if at any time within seven years after the passing of the Act the boundary of the city of Coventry should be altered so as to include any portion of the parishes of Foleshill and Stoke, the Company should, if required by three months' notice in writing, sell to the Corporation "so much of the undertaking, works, "mains, pipes, plant, and apparatus as is situate at the date "of the service of such notice within the area so included "in the city." It will be seen that under this clause power only is given to purchase the mains, pipes, plant, and apparatus of the Company "within the added area."

Now it so happens that the only actual works of the Company "within the added area" consist of mains and service-pipes; there being no sources of supply, reservoirs, or pumping machinery. Under these circumstances, the purchasers would, after taking possession, find themselves with neither water nor the means (even if they had it) of delivering it under pressure to the consumers; and so at first sight it would appear that an adequate sum to supply these essentials would have to be deducted from the purchase-money. This, however, was by no means the view taken of the matter by the Company, whose Advising Engineer (Mr. Joseph Quick, M.Inst.C.E.), in the course of his cross-examination, contended that the Company were unwilling sellers; while the Corporation, for their own purposes, elected to purchase part only of an undertaking designed as a whole. The Company had their statutory obligations to comply with in the portion of the district that would not be taken over; and although they would be left with larger mains and works than they at present required, this would be no gain to them. On the contrary, they would have proportionately a larger plant to maintain than would otherwise have been the case. As the Corporation did not further press this point, and their witnesses were silent upon it, we may fairly take it for granted that they admitted the justice of this view. The matter is certainly one of interest.

Another point raised during Mr. Quick's cross-examination had reference to the value of prospective income. Asked to justify his claim of 33½ years' purchase, witness explained that—always assuming the district supplied to be of a progressive character—the multiplying figure should be greater in the case of a company paying a small dividend than in that of one paying a large dividend. The reason for this was that the nearer the dividend approximated to the maximum percentage allowed by the Act, the less was the prospective increase in value. This is, of course, a point of great importance in the transfer of both gas and water undertakings, but more especially the latter. There are very many water companies which, though at present only giving a slight return—and perhaps even none—on their shares, are morally certain in course of time to earn the full maximum dividends; and to such concerns "prospective value" is a real asset. The point made by Mr. Quick will no doubt, in the forthcoming transfers under the Government Purchase Act, be made much of by those of the Metropolitan Water Companies who are not yet paying their maximum statutory dividends. Mr. Henry Rofe, M.Inst.C.E., who also gave evidence for the North Warwickshire Water Company, said that his valuation of the portion of the undertaking to be purchased by Coventry was 36·36 years' purchase of the prospective net income. To this, however, he added only 1½ per cent. for the cost of changing the investment, in place of the 10 per cent. usually allowed in cases of compulsory sale.

THE HEARD FUND.

Second List of Contributors.

WE are pleased to acknowledge the receipt, since the last issue of the "JOURNAL" went to press, of the following amounts in response to our appeal on behalf of Mr. Edward Heard's widow.

	£	s.	d.
Brought forward	32	19	6
Urick J. Burke (Bramdean)	3	3	0
Magnus Ohren (London)	0	10	0
Willey and Co. (Exeter)	2	0	0
	£38	12	6

The late Mr. John Ayris, M.Inst.C.E., who died at Great Yarmouth on the 8th of November last, left estate of the value of £43,885, including personalty to the net amount of £37,717. Subject to a few legacies, all the property is left in various trusts for his widow and four daughters.

It is not, perhaps, too soon in the year to remind readers of the "JOURNAL" who are subscribers to any of the Masonic Charities of the claims on their consideration for the case of Mrs. Sophia White, widow of the late Mr. T. W. R. White, of Sherborne. A determined effort is to be made by the Province of Dorset to secure a pension for Mrs. White at the forthcoming election; but in order to accomplish this, outside help is absolutely essential, as the Province is but a small one. Votes can be sent to the Office of the "JOURNAL;" to Mr. James Lowe, Gas-Works, Weymouth; or to Mr. William Davis, Brampton Villa, Seldown, Poole.

THE GRANTON WORKS OF THE EDINBURGH AND LEITH GAS COMMISSIONERS.

DESCRIPTION PREPARED

BY

WALTER RALPH HERRING, M.INST.C.E., *Engineer.* *

ARTICLE V., accompanied by Plate No. 6, which shows Plan, Elevation, and Details of Elliptical Girder-Roof over No. 1 Retort-House.

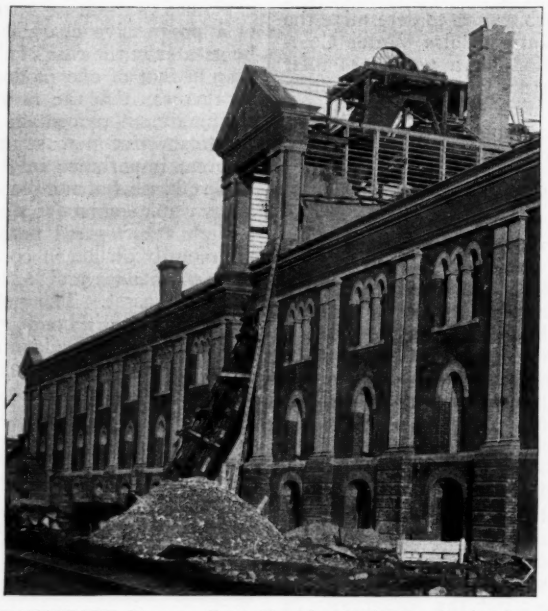
IT was in Huddersfield, in the year 1894, that the writer first applied the semi-elliptical form of roof for covering a retort-house, intended to contain a double, or back-to-back, installation of inclined retort carbonizing plant. The great height to which the structure of such a plant rises on the charging side, necessitates a high building of the ordinary class; whereas the circular girder-form of roof enables considerable economy to be effected in the construction of the side walls of the building.

In theory, the side walls of the building form only a shell or skin to protect the interior from atmospheric conditions; the base of the main girder being brought down either to the ground-line or to a point approximating therewith—local circumstances and necessities alone determining whether any side walls are necessary for mere appearance sake, or whether the arched formation would be sufficient if only covered with corrugated sheet-iron or slates.

The area covered by the Granton roof measures 389 ft. 2 in. long by 100 feet wide inside. The roof consists of sixteen semi-elliptical lattice-girder arched principals, spaced 24 feet apart, each fixed at its base to a cast-iron shoe, which in turn is secured by holding-down bolts to the brick piers rising to a height of 9 ft. 3 in. above the floor-line of the retort-house.

The curved girders are composed of a top and bottom flange-plate, of 12 inch by $\frac{1}{2}$ inch flat steel, to which is riveted a double row of 4 inch by 4 inch by $\frac{1}{2}$ inch angle steels, forming the top and bottom flanges of the girder, with double 5 inch by 3 inch by $\frac{1}{2}$ inch T steels forming struts between the inner and outer flanges interlaced with 3 inch by $\frac{1}{2}$ inch flat bars.

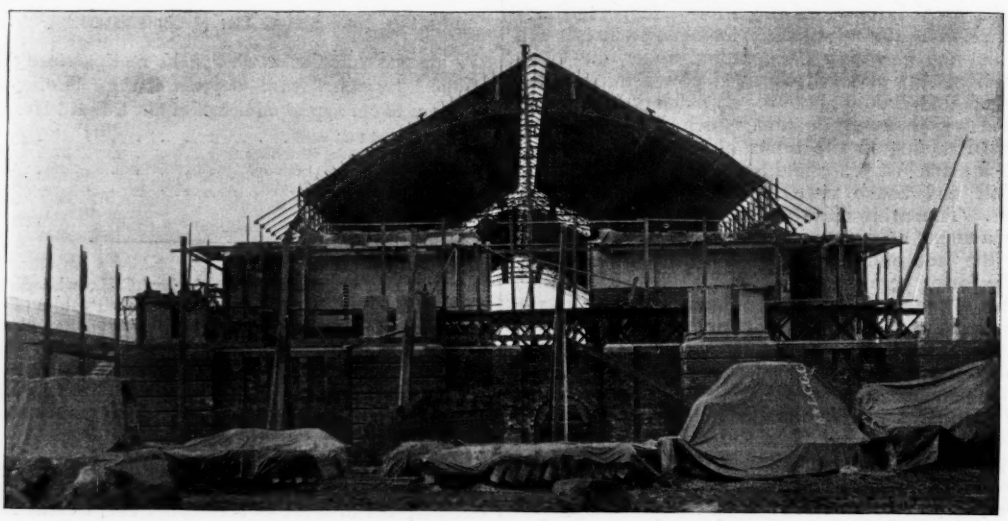
At all points where the longitudinal girders or purlins are attached, a $\frac{1}{2}$ inch web-plate is inserted instead of lattice bars between the top and bottom flanges, stiffened by means of a $3\frac{1}{2}$ inch by $3\frac{1}{2}$ inch by $\frac{1}{2}$ inch angle steel at the edge on either side. The bases of the main girders are filled in with a web-plate, $\frac{1}{2}$ inch thick, for a height of 6 ft. 6 in.; the greater portion of this height being in the vertical line. The extremity of the curved girder which is attached to the cast-iron shoe is further stiffened by a front-and-back $\frac{1}{2}$-inch gusset-plate, to which on either side a 5 inch by 5 inch by $\frac{5}{8}$ inch angle-steel is joggled, to form a base which, in turn, is secured by means of twelve $\frac{7}{8}$-inch diameter bolts to the cast-iron shoe-plate. Provision is made on the cast-iron base-plate for securing it to the foundation bolts, built within the piers; and upon the inner side of the casting a bracket is cast to afford support for one of the drawing-stage floor-joists (already referred to), which also acts as a horizontal strut to the buckstays of the retort-bench. The intermediate stage joist (these being at 12 feet centres), is attached at its outer end to a bow-string girder, placed horizontally, spanning from pier to pier, and being fixed to the cast-iron shoe-plate so that any thrust from the retort-bench or the intermediate piers is resisted by this member, and the consequent strain not thrown upon the light brickwork of the building.



PHOTOGRAPH No. 23.—East side of retort-house, showing formation of dormer roof for supporting transverse distributing conveyors, with elevator heads and gearing in position. (Nov. 22, 1901.)

It will be noted from the Plate No. 6 that the root of the curved members starts in a vertical line to a point about 6 ft. 6 in. from the drawing-stage line. The curve is a semi-ellipse, and is struck to a radius of 40 feet from a point 15 ft. 1 in. above the retort-house floor-line, and 8 ft. $4\frac{1}{2}$ in. off the vertical centre. This curve is blended into one of a radius of 56 feet, which is struck from the vertical centre line at a point 1 ft. 6 in. above the retort-house floor-line. The main curved girder is 3 feet deep, front to back, over flanges at the base, reduced to 2 ft. 6 in. deep at the crown.

There are ten lines of longitudinal box-girders forming struts or purlins; the end rows, north and south, resting upon template stones in the gable walls of the building. These are each constructed in the form of a latticed box-girder consisting of top and bottom flange plate of 12 inch by $\frac{3}{8}$ inch steel, to which are riveted four 3 inch by 3 inch by $\frac{3}{8}$ inch angle-steels. The girders in length measure 23 ft. 11 in., and are divided into four sections, at which points 5 inch by $2\frac{1}{2}$ inch by $\frac{3}{8}$ inch T-steel struts are introduced. At either end, a $\frac{3}{8}$-inch web-plate, with a 3 inch by



PHOTOGRAPH No. 24.—Illustrates the completion and slating of the roof before the completion of the side walls of the building. (March 8, 1901.)

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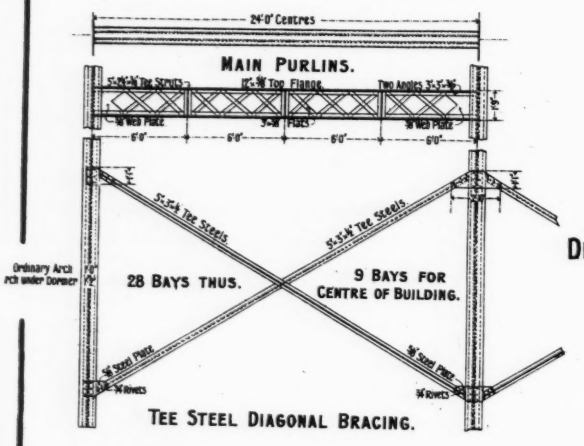
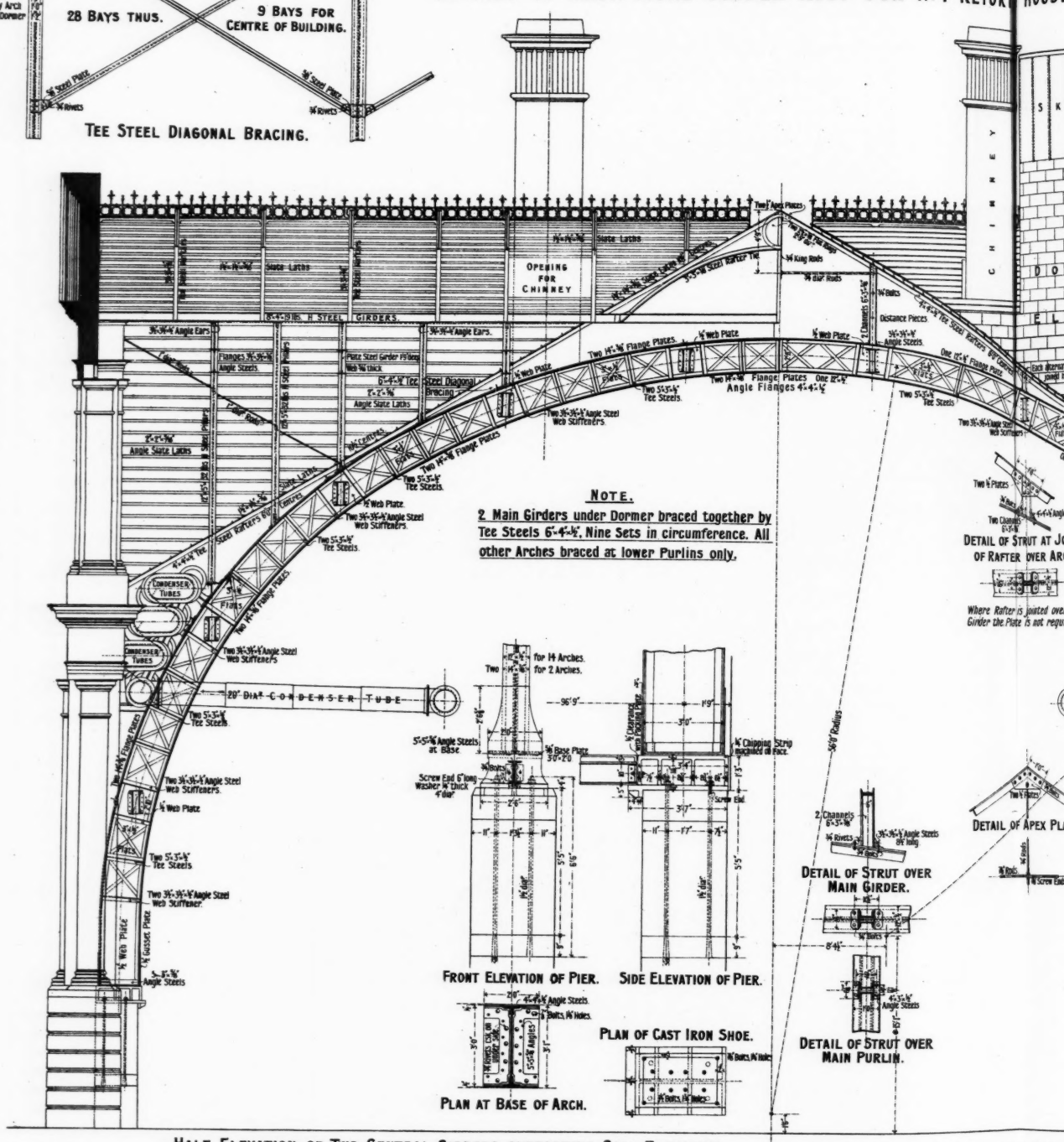
The Granton Works of the Edinburgh

DETAILS OF ELLIPTICAL GIRDER ROOF FOR No. 1 RETORT HOUSE




OPENING FOR CHIMNEY
CHIMNEY
NOTE.
2 Main Girders under Dormer braced together by Tee Steels 6'-4½", Nine Sets in circumference. All other Arches braced at lower Purlins only.
20' DIA. CONDENSER TUBE
FRONT ELEVATION OF PIER.
SIDE ELEVATION OF PIER.
PLAN AT BASE OF ARCH.
PLAN OF CAST IRON SHOE.
DETAIL OF STRUT OVER MAIN GIRDER.
DETAIL OF STRUT OVER MAIN PURLIN.
DETAIL OF STRUT AT JO
OF RAFTER OVER AR
DETAIL OF APEX PL

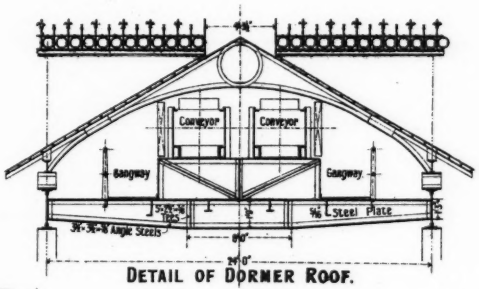
HALF ELEVATION OF TWO CENTRAL GIRDERS SUPPORTING COAL ELEVATING AND CONVEYING MACHINERY AND DORMER ROOFS.

HALF ELEVATION OF FOURTEEN MAIN

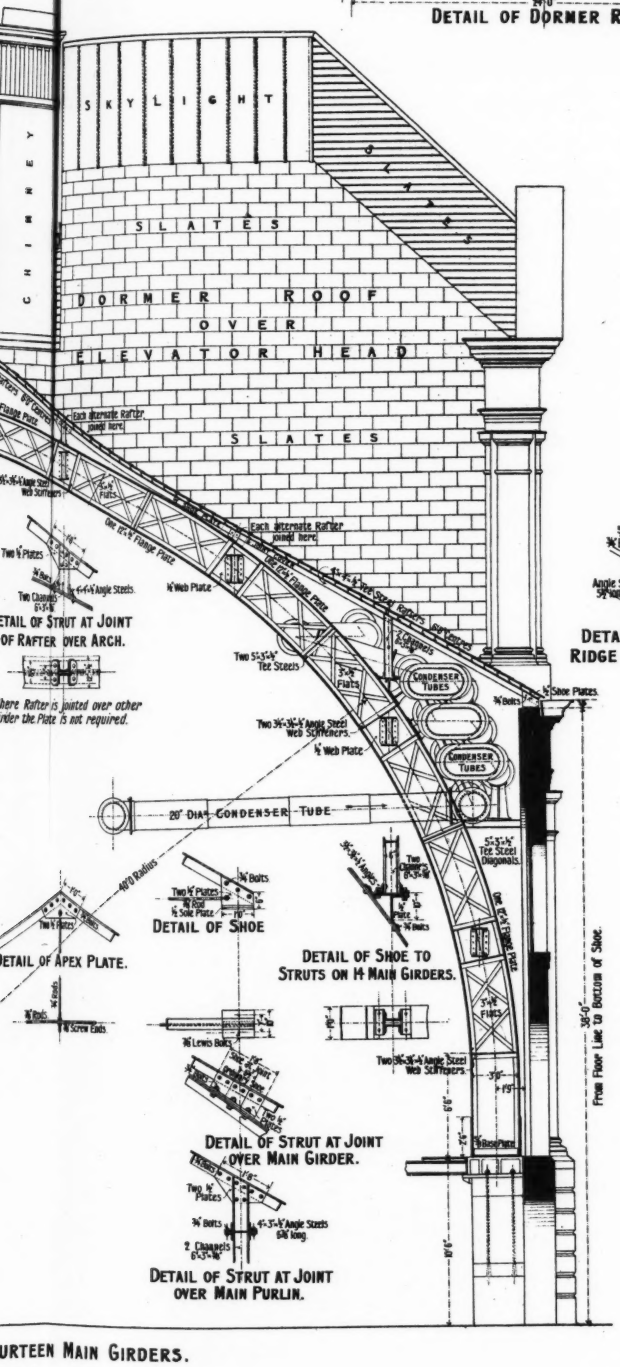
Copyright at Stationers' Hall.

No. 6.

RETORT HOUSE.



DETAIL OF DORMER ROOF.



DETAIL OF STRUT AT JOINT OF RAFTER OVER ARCH.

Where Rafter is jointed over other girder the Plate is not required.

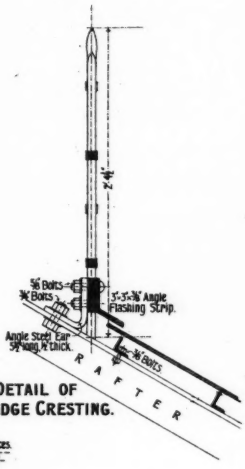
DETAIL OF APEX PLATE.

DETAIL OF SHOE.

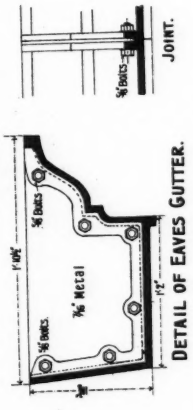
DETAIL OF SHOE TO STRUTS ON H MAIN GIRDERS.

DETAIL OF STRUT AT JOINT OVER MAIN GIRDER.

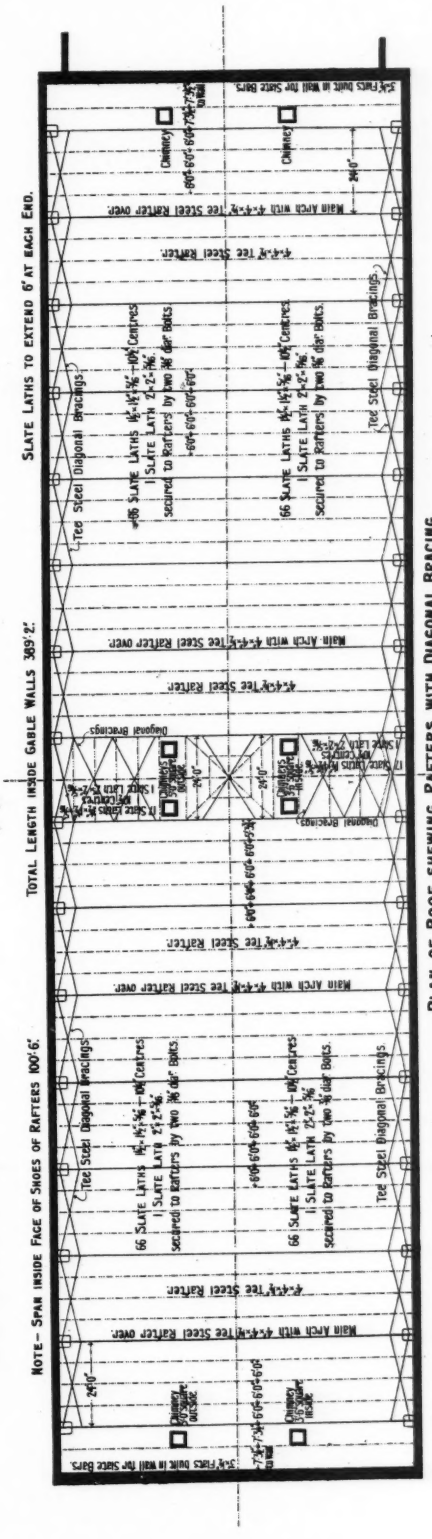
DETAIL OF STRUT AT JOINT OVER MAIN PURLIN.



DETAIL OF RIDGE CRESTING.



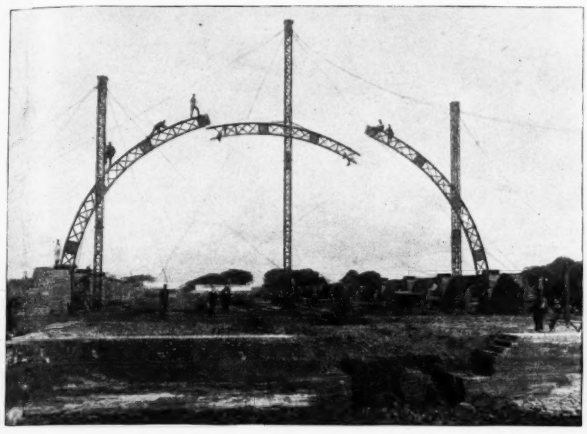
DETAIL OF EAVES GUTTER.


SLATE LATHS TO EXTEND 6" AT EACH END.
TOTAL LENGTH INSIDE GABLE WALLS 389'-2".
NOTE— SPAN INSIDE FACE OF SHOES OF RAFTERS 100'-6".
Chimney
Chimney
Main Arch with 4"-4"-¾" Tee Steel Rafter over
4"-4"-¾" Tee Steel Rafter
66 Slate Laths 16"-14"-12"-10" Centres
1 Slate Lath 2"-2"-⅜"
secured to Rafters by two 36 dia Bolts.
Tee Steel Diagonal Bracings
Diagonal Bracings
24'0"

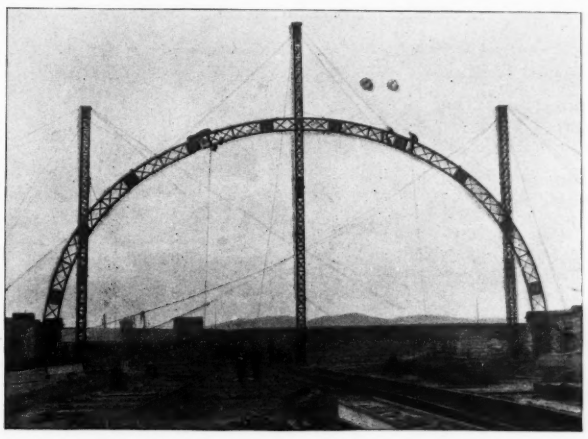
PLAN OF ROOF SHEWING RAFTERS WITH DIAGONAL BRACING.

URTEEN MAIN GIRDERS.

WALTER RALPH HERRING,
M.INST.C.E., *ENGINEER.*



PHOTOGRAPH No. 25.—Erection of the first girder at the south end of the retort-house. (July 7, 1900.)

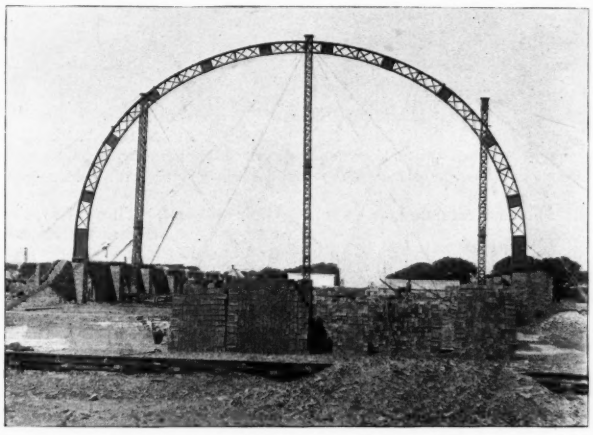


PHOTOGRAPH No. 26.—Erection of the first girder at the south end of the retort-house—joining the centre-piece to the two outsides. (July 10, 1900.)

3 inch by $\frac{3}{8}$ inch angle-steel joggled to form the ends for attaching to the web-plates in the main girders, is arranged; the intervening space being filled up with 3 inch by $\frac{3}{8}$ inch flat bars, diagonally braced.

Between the first and second tier of longitudinal purlins, the roof is diagonally braced by means of a line 5 inch by 3 inch by $\frac{1}{2}$ inch T steels placed back to back, secured to $\frac{5}{8}$-inch wing-plates riveted to the upper or back flange of the main-roof girders.

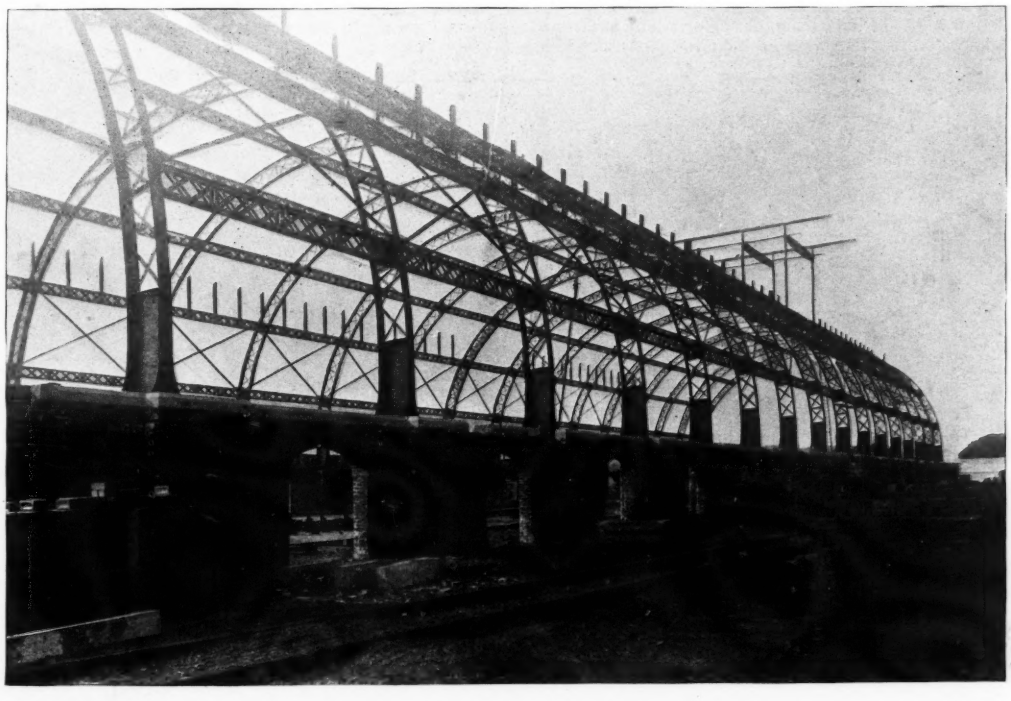
The two central main girders upon which the superstructure of the dormer roof as well as the transverse conveyors and elevators, gearing, &c., rest, required to be strengthened to carry the additional load amounting to about 70 tons. This was accomplished by introducing two 14 inch by $\frac{3}{8}$ inch flange-plates, forming respectively the top and bottom members, in place of one 12 inch by $\frac{1}{2}$ inch, as well as 5 inch by 3 inch by $\frac{1}{2}$ inch T steel struts at the point of juncture of every set of flat-bar diagonals. This bay was also diagonally braced throughout its entire circumference.



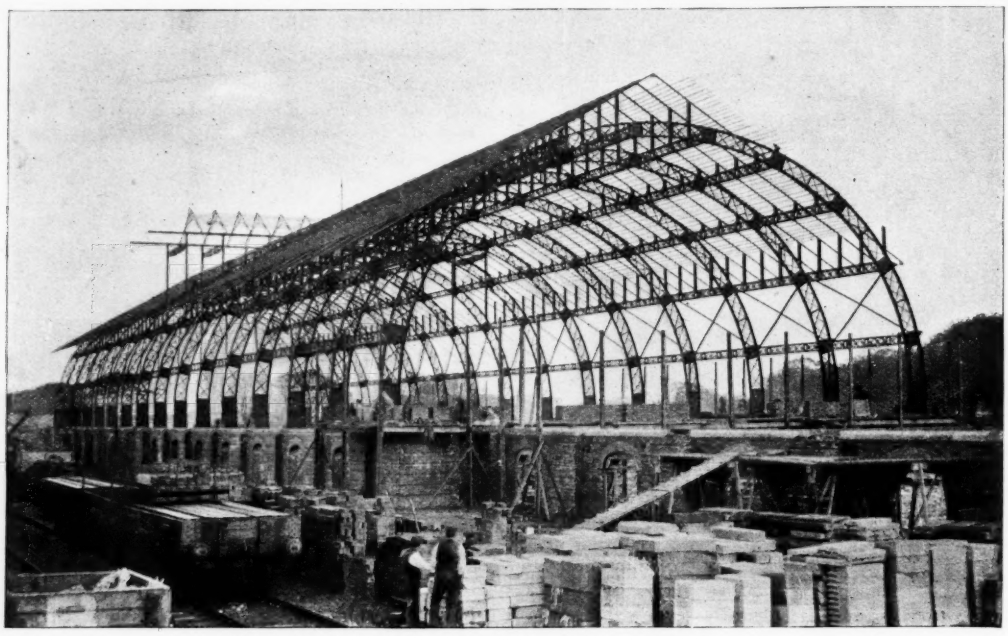
PHOTOGRAPH No. 27.—The first girder raised to its position on the internal piers of the retort-house, and stayed with guy ropes. (July 10, 1900.)

The roof itself is slated; the support for the slating consisting of 4 inch by 4 inch by $\frac{1}{2}$ inch T steel rafters, upon which slate laths $1\frac{1}{2}$ inch by $1\frac{1}{2}$ inch by $\frac{5}{16}$ inch are riveted at $10\frac{1}{2}$-inch centres. These rafters are placed 6 feet apart, supported upon steel standards attached to the back of the main curved girders, or resting upon the longitudinal girders (as shown in detail upon the drawing), and having steel shoes rivetted on their free ends, which rest on, and are attached to, stone templates on the top of the side walls of the building. A space 4 ft. 6 in. wide is left unslated at the apex of the roof, which admits both light and free ventilation under the main roof; experience having proved elsewhere in connection with retort-houses that the inconsiderable amount of moisture finding its way through this aperture in the form of rain, is of no disadvantage to the building as a structure, and no inconvenience in working to the workmen.

For appearance' sake, a double line of cast-iron cresting is attached to the rafters throughout the length of the building, at



PHOTOGRAPH No. 28.—Particularly illustrates the position of the diagonal bracing of the roof as well as the early outline for the dormer roof construction. (Aug. 30, 1900.)



PHOTOGRAPH No. 29.—Shows the slate laths and rafters in position, supported upon the main girders and the longitudinal purlins, as well as the exact position of the diagonal bracing along either side. (Oct. 6, 1900.)

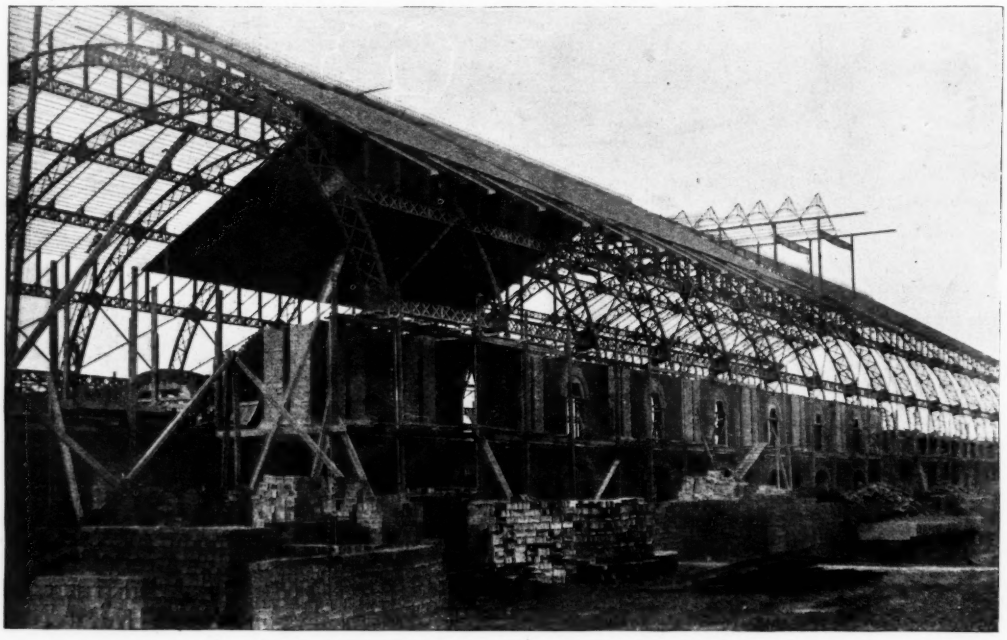
the point where the slating finishes. It is also returned, as shown on Plate No. 3, along the dormer roofs.

The dormer roof, Photograph No. 23, was provided to permit of the elevator heads, discharging arrangements, and the transverse conveyors feeding the main conveyors over the coal bunkers being snugly encased beneath; the original ridge level of the dormer roof being the same as the main ridge of the retort-house roof. It was, however (after the detail drawings of the elevating plant had been fully prepared) found impossible to satisfactorily arrange for the elevators to discharge at this level. An alteration was, therefore, made as shown in Plate No. 6, by still further raising the superstructure on the two main curved girders, on the west side where the elevator enters the buildings—the original level provided for being sufficient for the transverse conveyors.

Photograph No. 23 shows clearly the position of the elevator heads within this structure, as well as the method of construction adopted.

Another considerable advantage which weighed with the writer in adopting this type of roof both at Huddersfield as well as at Edinburgh is the fact that it can be erected, and almost completely slated, irrespective of the fact as to whether the side walls are completed or not. In both instances referred to, the retort-house was completed to a line where the curved girders received their support. Thereafter, the roof erection was proceeded with irrespective of the construction of the side walls of the building and completed sufficiently far to enable the main portion to be slated—thus protecting the interior, and permitting the construction of the retort-benches to proceed beneath it, protected from rain, &c. In this particular instance, in fact, the retort-benches were finished ready for the mouthpieces by the time that the building of the retort-house was completed.

The rafter shoes resting upon the upper portion of the side walls of the building are merely secured to it by means of lewis bolts cemented into the stone capping-course, and screwed thumb tight; the shoes having long slotted holes in the base to permit of the free expansion and contraction of the roof without transmitting any stress to the side walls of the building. Strictly speaking, the unsupported portion of this rafter—as between the last support obtained from the curved girder of the roof and the end of the shoe—measures only 10 feet; and this, being 4 inch by 4 inch by ½ inch T steel, is almost sufficient (acting as a cantilever) to support the slating resting upon it. The roof, as a matter of fact, to the last point of support from the curved girder beneath the main rafters, was slated long before the side walls of the building were completed, in order that the interior operations might be proceeded with without delay—see Photograph No. 24.



PHOTOGRAPH No. 30.—Shows the roof partially slated, and the construction of the side walls of the building. (Nov. 28, 1900.)

Plate No. 6 gives the plan of the roof, together with the details supplied to the contractors for its construction. The ornamental cast-iron gutter was also made to form the upper member of the cornice; all the castings being painted to match the colour of the stone.

The accompanying photographs illustrate in a pretty clear manner the method and progress made with the erection of the roof, and in conjunction with the detail drawings will give many points of considerable interest to an engineer.

The retort-house is fitted with four benches, each of the capacity of 2½ million cubic feet of gas per day. Each bench is provided with a 20-inch diameter foul-main condenser, which is secreted at the back of the haunch of the main girder, in the angular space between the roof and the side walls and these are shown upon Plate No. 6, but will be more particularly referred to when dealing with the question of the carbonizing plant.

It only remains to say that the net area covered inside the building is 4324 square yards.

The accompanying series of photographs illustrates in a very clear manner the method, as well as the progress, of erecting the retort-house roof. From Photograph No. 25 it will be seen that the central derrick is erected, running upon the railway which existed in the centre-line of the retort-house. At either side a smaller derrick was also erected. The curved members were divided into three portions, these three portions being afterwards reared—first the two outside members, and finally the centre-piece, as illustrated in Photograph No. 25.

Photograph No. 26 shows the centre piece just being attached to the two members on either side. In this position, it was riveted up; and finally, by means of the three derricks, it was elevated to the position shown on Photograph No. 27, where it was afterwards secured by guide-ropes until a sufficient number of principals had been erected to permit of their being properly stayed by the longitudinal girders. The height from the floor-line to the underside of the curved girder, it may be mentioned, is 56 ft. 3 in., and the span 100 feet.

By July 9, 1900, the first member had been erected and riveted in position; the derricks having been moved forward ready for the next piece. By Aug. 13 (see Photograph No. 15, *ante*, p. 150) eleven out of the sixteen members had already been erected. The total absence of scaffolding in connection with this work is remarkable; and the masterful manner in which the work was proceeded with reflects considerable credit upon the contractors, Messrs. Clayton, Sons, and Co., Limited, of Leeds, and their erector. Even for the rivetting up of the members and the different parts of each member, the hot rivets were hauled up in tin cans from the floor-line, and the men "hung on by their eyebrows" or any other possible means they could discover that left their two arms free to do the rivetting in mid-air.

Photograph No. 28 shows some further progress, and is given to particularly illustrate the position in which the diagonal bracing in connection with the roof was placed. Photograph No. 29 shows the roof practically completed—including the rafter supports as well as the slate laths. Photograph No. 30 shows the principal portion of the roof already slated, as well as the dormer roof across the transverse centre of the same.

There are, in addition to the foregoing, many points in the photographs of interest to the engineer; and they will well repay careful inspection.

Examining the Interior of Gas-Engine Cylinders.—A device for allowing of the examination of the interior of gas-engine cylinders while running was recently described in the "Engineering News." Into the rear cover is screwed a pipe nipple of say ½-inch iron pipe size, and having a long thread on one end, which is screwed into a 1 inch by 1½ inch reducer, into the outer end of which is screwed a 1 inch by ¾ inch bushing used as a stuffing-box nut in holding a piece of thick plate glass in position at the end of the ½-inch nipple. The glass is separated from the nipple and from the iron washer of the stuffing-box by means of asbestos gaskets. To prevent breakage from overheating, the glass should be several inches from the inner side of the cylinder cover, and small enough not to touch the inside of the reducer. With this apparatus, the blue flame characteristic of complete combustion can easily be distinguished from the yellow flame that indicates the presence of incandescent carbon.

Coke-Beds for Sewage Purification.—In his fourth report to the London County Council on the bacterial treatment of sewage, Dr. Frank Clowes, their Chemist, states, as the result of prolonged experiments, that by suitable continuous and undisturbed sedimentation, raw sewage is deprived of matter which would choke the filter-beds, and the sludge which settles out is reduced largely in amount by bacterial action. In fact, during the first six months of the experiments, 25·6 per cent. of it was thus destroyed; while later on this figure was raised to more than 50 per cent. The coke-beds, after they have developed their full purifying power, have an average sewage capacity equal to 30 per cent. of the whole space which has been filled with the coke. The capacity of the coke-bed fluctuates slightly, but undergoes no permanent reduction. The beds do not choke, and the purification steadily improves for some time. Coke of suitable quality does not disintegrate during use. The effluent does not putrefy even in summer, and fish can breathe in it.

THE DILEMMAS OF THE GAS ENGINEER.

Is an addition of a new faculty necessary to complete the instruction of gas engineers for the proper pursuit of their vocation? The question may well be asked, in view of the numerous and urgent technical problems, of the greatest importance, which lie before gas engineers at the present moment, all calling for solution at the hazard of professional reputation. Only to mention a few of these, there are methods of carbonizing coal and of the equipment of gas-works for the saving of labour costs; methods of water-gas production, and the advantages thereof; and methods for preventing naphthalene troubles. Which is the best method? Wherein does its superiority consist? Is it worth while to adopt it? Such are the instant questions which lie before the gas manager of the present day at every step of his daily round. He cannot get away from them. If he shuts his eyes to their appeal, he classes himself by the same action. Whether he makes a decision or abstains, he is making reputation; and it is as impossible for him to shirk the responsibility as it is to jump off his own shadow.

In the circumstances, therefore, Dr. Kennedy's definition of an engineer as "a person who is constantly being required to make up his mind," appeals directly to the modern gas manager. The facts being as stated, the question that suggests itself is as to whether it is possible for a man of this order, by taking thought, to strengthen and train his judgment. Is it possible to learn how to understand and interpret facts? It is a question of questions. One thinks in this connection of the venerable jury-man's oath, by which the good man and true binds himself to find a true verdict upon the evidence, and reflects that in the great Assize of Life every man in a post of responsibility is under pledge to do the same thing daily to the best of his ability, at his peril. How are mistakes of judgment to be avoided? It is most hard to answer. There is in the minds of most people of any education at all—whose native powers of mind, that is to say, have been consciously touched and improved by some process designed for the purpose—a strong respect for such processes in general, which extends to those of which they have had no personal experience. They argue from the known to the unknown. They are aware, for instance, that by properly employing arithmetic, it is possible for an inquirer to obtain trustworthy answers to questions of number which he could not otherwise arrive at. He can trust these answers as implicitly as he does his own perceptions, which assure him at a glance of the number of pebbles he can hold in his hand. Roughly speaking, the ordinary practical man's idea of the use of all sciences is of this character. He is willing to credit them with the power of furnishing trustworthy answers to questions which otherwise must remain unanswered, or only be answered provisionally by toilsome and risky tentatives. The practical man has no use for a science which cannot do this. The mathematical kind of proof is the only one he can work with and employ as a tool. There may be other sciences, suitable for Sundays and the exercising of the mind during leisure hours; but these are not "business."

Well, now, in these circumstances, is there any science of the Reason that can be recommended to the practical man, by facility in the application of which he can depend upon getting from sound premises to a trustworthy conclusion? Unfortunately, the reply to this inquiry must be in the negative. There is a sort of science called Logic, much renowned in scholastic circles; but it does not pretend to enable those who study it to interpret evidence better or more justly than those who know it not. It is not for us to say what is the good of school Logic; but it is very certain it does not inculcate sound reasoning. It strikes one as remarkable that, of all possible subjects of education, that of finding a true verdict upon the evidence has never been systematized. Like knowledge of the common law of England, it is assumed to be innate. Yet how far removed is the assumption from the fact! So it is that for every positive tenet in the world's affairs there is its contrary. Name an article of faith, and its "anti" forthwith occurs to mind. The fervour with which a tenet is held is reflected in the passion with which it is denied.

All these thoughts do not tend to encourage an engineer who finds himself presented to a collection of facts which it is for him to interpret. The worst of it is, sometimes, that the matter is not new. It is not as if a new generation of engineers had only their own novel technical problems to solve. They have these, it is true; but they also have to continually review their precursor's conclusions. This truth was well brought out some time ago by our contemporary the "Engineer," on certain evidence published at the Düsseldorf Exhibition which opened up again the whole technic of steel tempering and hardening. The familiar explanation of the phenomena which satisfied generation after generation of blacksmiths has to be reconsidered. So it is in other engineering questions. The British Admiralty have given instructions for the carrying out of experiments on screw propellers, after sixty years' experience of their use. The value of liquid fuel is to be inquired into all over again.

The real difficulty of arriving at the truth lies in interpreting and appreciating the facts of experience—in other words, in finding a true verdict on the evidence. The facts in themselves may be right enough. The experiments may have been honestly

conducted and their results be clearly stated. The evidence is perhaps ample and adequate; but still it often fails to be properly understood. The observer may be biassed, or may be lacking in that power of accurate judgment which is man's crowning attribute. "Mistakes are usually the consequence of want of perception of the place which a given fact ought to take in a crowd of facts. There is no such thing as an isolated phenomenon; and in the same way, and for the same reason, there is no such thing as an isolated fact." It is our limitations that so constantly make us see a fact by itself, and prevent us seeing the whole truth. Now, the exaggerated presentment of what is true enough so far as it goes, and making it appear the whole truth, is heresy.

The precise relations of a fact to other facts, of part of a truth to the whole, are matters that can only be ascertained with strict regard to the circumstances of the particular case. Even when there is so much evidence for one particular fact, or order of facts, as to amount to the indication of a general rule, there are commonly exceptions; and the exceptions, as the phrase goes, "prove the rule." But how many of those who so habitually and glibly repeat this saying, as though it expressed any amount of solid wisdom, have given themselves the trouble to think of the precise meaning that attaches to the word "prove" in this place? The word has two meanings, not at all synonymous—to establish, and to test. Here it is employed in the latter sense. For, how is it to be understood that an exception can prove a rule? It certainly does not help to establish the rule—quite the contrary, indeed; for too many exceptions would upset the rule altogether. But the exception to a general rule which is worthy of respect "prove" it in the sense of testing it. They indicate its limitations, and warn us against falling into the vulgar error that a general rule is tantamount to a law.

From all such considerations we get back to the starting-point of the present inquiry, which is as to whether an engineer can hope for any systematized help in interpreting the facts which encumber his daily round of duty; and we cannot get deliverance from the categorical negative. The educated man is no more likely to judge positively aright than the uninstructed; though he is not so likely to fall into error. This saying, albeit it may appear at first sight a contradiction, is not really so. For as the special juror is usually to be more trusted than the common juryman, so the better the engineer the less likely he is to be misled by the accidents of his problem. In a world so prone to error, even a percentage of probability on the side of rectitude of judgment is worth something.

THE PRESIDENT OF THE BOARD OF TRADE ON HIS DEPARTMENT.

THE topic of municipal trading was ventilated last week at the Society of Arts; a paper on the subject being read by Mr. Dixon H. Davies, under the presidency of the Lord Chief Justice. We give elsewhere a short abstract of the paper, which was very long; and as the discussion had to be adjourned, it will be better to defer any comments on the proceedings until we are in possession of all the speakers' remarks. Meanwhile, a most important contribution to the available stock of materials for consideration with respect to the existing national system of organizing trade and commerce, was supplied by Mr. Gerald Balfour, the President of the Board of Trade, in a speech at the annual banquet of the Chamber of Commerce of Newport, Mon. Mr. Balfour took for his principal topics the constitution and the policy of the department of which he is not only the official head, but also, as he explained, the deliberative body. The facts, as he recounted them, are a remarkable example of the working of the spirit of British institutions, which, like the operations of Nature herself, are evolutionary rather than intentional creations. Theoretically, the Board of Trade is a Committee of the Privy Council for Trade and for Plantations; and as such it is more than 200 years old. In theory, also, its composition is of a character that borders upon the ludicrous, including as it does the Archbishop of Canterbury and the Speaker of the House of Commons. This is precisely the kind of fact which people who desire to poke fun at the hoary features of the British Constitution delight in mentioning, for the reward of a cheap laugh. It is of a piece with the fancy of advocates of the metric system of weights and measures for enumerating what they are pleased to describe as the absurd units of the English system —the fodders of lead, the barleycorns, and the lasts. Such critics forget that these are not the sort of considerations that affect the real question, which is that of serviceability. Nature has a remarkable way of working with the organs she is familiar with, and where an old member or process can be made to serve her turn, she never goes out of her way to invent a new one. Similarly, the British Constitution, to the light merriment of the injudicious observer, may start a Department of State with an Archbishop and the Master of the Rolls; and in the fulness of time it will appear to consist only of an individual statesman, who will be advised in the discharge of the functions of his office by a staff of assistants. The only question worth considering in such a connection is whether the arrangement works satisfactorily.

On the occasion now under notice, the President of the Board of Trade was duly reminded of his theoretical colleagues of the Department; and he made a deft use of the somewhat musty humour of the record. He explained that whatever the theoretical composition of the Committee of the Privy Council whose constitutional authority he exercised, in point of fact the Board of Trade is the President. It is a Board with a quorum of one. Is not this a realization of the ideal of an executive committee—three members, of whom two are habitual absentees? This is practically what the Board of Trade has come to be; and by common consent it is an arrangement admirably suited to the purpose. At the present juncture, when the question of how to promote the efficiency of the superior administrative organization of industrial and public service undertakings is prominently before the public mind, the example of the Board of Trade is very much to the point. It cries out for comparison with the large membership and the transitory composition of local authorities on the one hand, and with that of boards of directors on the other. Is there not something for both to learn, in the constitution of this order of Government Department?

Not merely in theory, but also in practice, the organization of a municipal corporation is as widely different as it could possibly be, in every essential respect, from the Government Department. We have already seen that the theory does not matter; but the actual facts do matter very much indeed. They are everything, in effect; and the actual differences between the Board of Trade and a municipal corporation are so radical and far-reaching that it is sufficient to draw attention to the truth. There is no need to go into the details, even if this were possible. The best we can do with this aspect of the subject is to recommend those who take an intelligent interest in the growth of municipalism in this country never to lose sight of the conditions under which municipal work is carried on, as compared with those that rule a great Department of State. It is not necessary to hold that all is right in one case, and therefore wrong in the other where things are otherwise ordered. Only, let the extent and nature of the differences be noted. For instance, there is the question of headship. A public man, of character and parts, is the head of the Government Department. He is responsible to Parliament, to the nation, to his own constituents, and to his colleagues who gave him their confidence, for the rightful discharge of the duties of his office. He is by his origin a man of his time, and a part of the Administration of the period. Even the political side of his credentials accentuates this representative character of the holder of office. The result is that he brings into the seclusion of the board-room something of the prevailing wind of public opinion. He is not only master in his own branch of the public service, but is also the servant of the public, and in his degree the architect of his own fortunes and the custodian of his colleagues' reputation. Moreover, the distinctions and emoluments of responsible office are considerable; and the prospect of promotion is never closed.

Contrast this with the possibilities of (say) a member of the town council of the largest municipal corporation in England. There is sufficient reward for any burgess, it is true, in the unpaid service of his town, where he is known. It is an honourable distinction to sit on the local bench, and to assist in the direction of the affairs of local government. Mayors and provosts, bailies and aldermen, town councillors and members of the humblest rural authority, play a great part in the life of the nation, and carry on a tradition of honourable service which descends from a remote past and corresponds with a perennial necessity. It is not for nothing that the Lord Mayor of London is the King's friend, to whom, in his representative capacity, the first announcements of events of importance touching the Royal Family are by immemorial custom addressed. But it is very certain that on their executive side, which nowadays includes all manner of trading enterprises, local authorities from the biggest to the smallest are weak. Their departments have no such heads as the departments of the National Government; nor can have. The margin between the local politician and the local statesman is too narrow. If the most notorious demagogue does not swiftly get into place and power, he and his backers want to know the reason why. It is a matter of great and growing difficulty to procure the continuous services of the right kind of citizens in the most important offices. There is no Cabinet, so to speak, in a municipality. Consequently, there is no co-ordination of the various branches of the executive. It is quite common for the city surveyor to ignore the gas engineer, or for the water superintendent to have no relations with anybody except the town clerk. This clashing of the municipal departments amounts in some localities to a great evil. The town clerk is usually a sort of "mayor of the palace;" but the circumstance of his being an able and devoted public servant does not in the eyes of a section of the elected excuse his also being a refined gentleman of greatly superior social standing to themselves. The analogy of Parliament does not hold good with local authorities; and a Labour member at St. Stephen's occupies a less difficult position than his fellow on a town council.

The object-lesson of the working organization of the Board of Trade is of equal validity in regard to the administration of joint-stock companies. The need of efficient directors in substitution for those of the "ornamental" variety, to whom a less respectful description is very frequently applied, is also a recognized want. Not to give the subject a too particular application, it is enough to remark that, from gold mines to laundry companies, the cry is all for directors who know something of the business they are

supposed to direct. "Everyone is agreed," says a financial contemporary, "that the present system is all wrong, and no one can suggest any practicable method of altering it." Theoretically, a board of experts would be preferable to a board of well-meaning incapables; but in practice the solution would not be found easy to arrange, or always satisfactory when achieved. Theoretically, again, the remedy lies with the proprietors; but in point of fact shareholders never move until it is too late to do any good. Happy is the company that can rely upon having one strong, capable man at the head of affairs. He should be the chairman or president—to carry out the example furnished by the Department of State. He should be adequately paid; yet he should have a soul above the immediate emoluments of his office. The latter condition may appear difficult of fulfilment; but it is nevertheless desirable as marking the difference between the head, and a subordinate official. A certain, if indefinable, degree of detachment from the more engrossing interests of ownership is a useful corrective of that selfishness which is the vice of individualism.

Lastly, Mr. Balfour's critical eye was turned upon his own office; and this is what he saw: A Minister of Commerce without the name, and of inferior rank in the Government hierarchy of a professedly mercantile nation. It seems anomalous; but it would not be of a piece with the British Constitution if it were anything else. If the English are a nation of shopkeepers, it is remarkable that the representative of trade in the Government holds an office of the second class. Yet so it is; and Mr. Balfour was not altogether at a loss to explain the circumstance. British Ministers are not in the habit of posing as Earthly Providences, like some of their foreign compeers in title. These most worthy gentlemen usually take themselves much more seriously than English statesmen ever think of doing. They can hardly help themselves in this respect, inasmuch as they are regularly looked to as the appointed dispensers of the good things of government. It is they who have the control of protective duties, subsidies, bounties, the making of railways, the ordering of railway rates, and of all manner of ways of facilitating the course of trade in favour of their disinterested (?) supporters. The whole history of foreign domestic politics is charged with the influence of this apparently incurable vice of favouritism—which, of course, is at the bottom of the theory of Protection.

It is one of the chief benefits of the English system of rotation on the part of the chief officers of the State, that they are individually strong enough to resist the pressure to magnify their office while they have some power of doing so. It is impossible for a President of the Board of Trade to seek a popularity which would be an embarassment for the Chancellor of the Exchequer. Besides, it is comforting to think that, after all, an English Secretary of State is a reasonable English Member of Parliament, and not a dictator, nor a doctrinaire. Whatever his predilections, he dare not shut his eyes to the course of the industrial and fiscal policy of his country during the past half-century, nor wilfully misread the results. If England holds the financial centre of gravity; and if the English sovereign, spent at home, goes farther than any money laid out elsewhere, then it follows that, as Mr. Balfour says, "the spirit which has animated our commercial and industrial policy during the last 50 years was a wise spirit," and is deserving of conservation. Which is a very good sentiment for a peroration; but does not absolve English citizens from the obligation to incessantly seek the best means of keeping their national affairs in order.

ELECTRIC LIGHTING MEMORANDA.

The Record of the Liverpool City Electrical Engineer—State of the Undertaking—The Financial Position—The Parliamentary Aspirations of the London County Council.

THERE is much interest of a particularly personal kind in the excellent record of Mr. A. Bromley Holmes, the City Electrical Engineer of Liverpool, who has just resigned this position on the ground of ill-health. We regret the cause of Mr. Holmes's retirement from an office he has filled so long to the utmost satisfaction of his employers, but congratulate him on the substantial recognition of his services which is conveyed by his retention as Consulting Engineer to the Corporation at a salary of £1000 a year. Evidently, the traditional distinction of the city still holds good; and "Liverpool gentlemen" are far from being an extinct race. Mr. Holmes has done the electricity supply of Liverpool since 1883, when the old Company commenced their operations. It is a long record for electrical engineering. It may be doubted if there is a longer or a better. So well qualified was the Company's Chief Engineer for his post, that, when the undertaking was taken over by the Corporation in 1896, he went with it; and he has guided its technical development ever since. Let any engineer think for a moment what this means, in the case of so absolutely novel a business as electricity supply from a central station. Twenty years ago the whole thing was to do from the very egg, so to speak; and Mr. Holmes has done it. Nor has he gone without his reward. It was not excessive—a salary of £1800 a year at the most, for the work and responsibility of engineering one of the largest electricity undertakings in the United Kingdom, with a capital investment of nearly £1,250,000.

Yet Mr. Holmes's position cannot be esteemed other than a distinguished one, such as any professional man would be proud and pleased to occupy. His experience is perhaps exceptional; but it is reassuring to hear of even one electrical engineer in municipal employ properly appreciated and not inadequately paid. In a way, the satisfaction reflects on the gas engineering profession, in the assurance it gives that faithful and capable service need not go unrecognized. For there is no mere accidental connection between Mr. Holmes's tenure of office and the prosperity of the undertaking of which he was the brains. During the past year, the output of the department exceeded 23 million units; and the works costs, including management, were brought down to 0·9d. per unit. The profit balance on the year's working, after payment of interest and sinking fund was over £33,000. There is some peculiar finance about this Liverpool undertaking; inasmuch as hitherto the price charged for the large quantity of current sold for tramway traction was extremely low, at 1·2d. per unit, which rather looked as if the Corporation were disposed to favour the tramway business at the expense of customers for lighting. Their advisers, however, knew what they were about, and the tramway traction rate, though severely cut, was not really beneath cost.

Now the Corporation appear to be reaping their reward; for at so low a generating cost, every branch of the electricity supply business must be paying its way. And, besides, as all the world knows, they are not so foolish as to fritter away their money in unprofitable public lighting. The station has developed a high load-factor—the highest, we believe, in the United Kingdom. It would be instructive to have Mr. Holmes's experience in respect to depreciation and antequation of electrical plant. From our point of view, one of the most interesting facts of the Liverpool undertaking is that it was founded as a private speculation, and acquired by the Corporation honestly—at a premium. This proceeding is commonly held up to opprobrium by perfervid advocates of municipal trading, on the ground that such a payment includes an amount of "ransom" which a Corporation might save by being their own pioneers. The truth of the matter is, however—as most experienced persons know—that it does not make any difference in the long run when the bargain has been a fair one. In the case of Liverpool, notwithstanding the amount of premium paid to the founders (which was about 60 per cent. on the nominal capital), the capital of the undertaking is now only about £60 per kilowatt of plant capacity, which is, of course, well below the average. This figure also speaks eloquently for the engineering of the past twenty years. There cannot have been many mistakes.

It behoves all parties concerned to keep a sharp look-out on the London County Council Electricity Supply Bills for the ensuing session. There are two of these, entrusted to different Parliamentary Agents. One is a repetition of the attempt of the Council to attain the position of general electricity suppliers in bulk to authorized Metropolitan municipal undertakings; and the other is the General Powers Bill of the Council, into which are slipped a couple of clauses to authorize Metropolitan Borough Councils "to expend money upon the wiring and fitting, and supplying with wires, fittings, and apparatus the premises of their consumers or prospective consumers," and to borrow the necessary money for this purpose. This is nothing else than a barefaced attempt to get over the veto of the Local Government Board on the expenditure of public loans on works in private houses. If it were to pass through Parliament, any Metropolitan Borough Council might finance a favoured speculative builder to the extent of fitting up his houses while in the carcass with electric lighting wires, and encourage the aspirations of possible voters for more "sweetness and light," by giving them the run of a few fittings manufacturers' catalogues. There is not, one may express the hope, much likelihood of so simple an expedient for getting over the "wiring difficulty" passing the scrutiny of the Government Departments, or the eagle eye of the Lord Chairman of Committees. There must be a line drawn against the reckless extension of the enterprise of local authorities in the direction of the providing of "free" luxuries at the expense of the ratepayers. The London County Council has been trying in some respects to make itself respected by the Metropolitan local authorities for its sound financing of their affairs. Yet here we find the same central authority contemplating the spending of large sums of public money in places from which it could never be recovered. We notice that the London Electrical Contractors' Association do not half like this idea of the general turning of local authorities into providers of house wiring and fittings; but it is not the trade who have the most reason to be alarmed at such an enlargement of the scope of municipal trading. It almost looks as if the London County Council, in thus abusing their exceptional privileges of approaching Parliament without requiring the assent of the ratepayers, were "riding for a fall." The Council cannot possibly be permitted to keep on indefinitely sowing these parliamentary wild oats.

Bricks from Spent Lime and Cinder.—Experiments are at the present time being conducted at the New Wortley gas-works of the Leeds Corporation, in the making of bricks from spent lime and cinder. It is reported that they promise to be successful, and that a serviceable class of brick, the colour of cinder, has been produced. Paving flags may be made by the same process.

LIFE IN THE GAS INDUSTRY.

An Instructive Diagram.

THE remarkable evidences frequently given in the "JOURNAL" of the great vitality that the gas industry has shown during recent years cannot be relished by those who would have the public believe that gas is in a state of rapid decline. A striking illustration was that of the photographic reproduction of the line of Tottenham gasholders published in our issue of the 6th ult. The small holder in the distance exemplified the position of business in gas supply years ago; and each succeeding new holder, greater in circumference and in height than its predecessor, tells its tale of the constantly broadening and rising stability of the industry. Substantial increment upon increment has come with the passing years; and the holders have grown accordingly. This week we have the opportunity (of which it is a pleasure to avail ourselves) of reproducing a diagram which Mr. J. H. Brown carefully kept until almost the day that he left Ilford for Nottingham. It presents in an impressive and instructive manner the wonderful ascension of the output of gas in the district of the Ilford Company during the past five years. Furthermore, it shows the temporary effect of the introduction of the electric light and of the elimination of the gas supply to 600 public lamps, when these were replaced by electric lamps.

Each year's scale is a study in itself; and readers will be able to note several interesting points in them without any special direction on our part. Each year commences with July and ends with the following June; and from point to point represents the

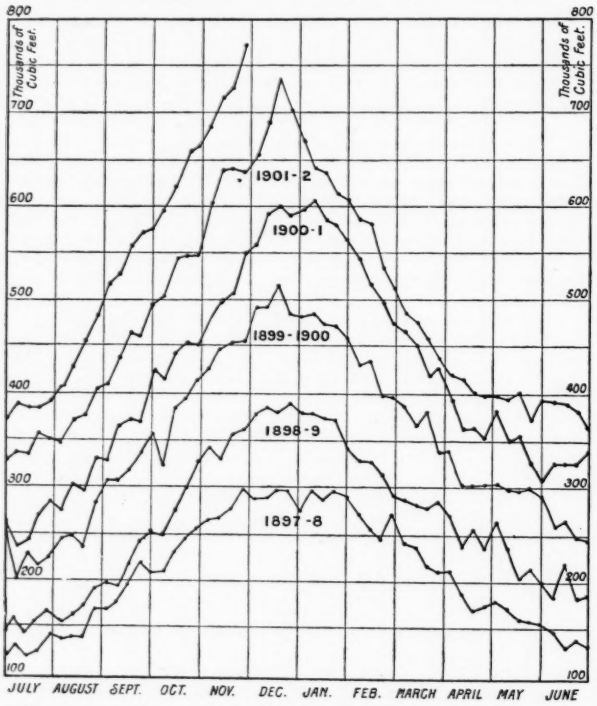


DIAGRAM SHOWING FIVE YEARS' WEEKLY CONSUMPTION OF GAS AT ILFORD.

progress or recession of the consumption during a week. The horizontal figured lines represent hundreds of thousands of cubic feet—starting at 100,000 cubic feet. Each year, it will be seen, has commenced well in advance of the preceding one, and has superimposed, with remarkably little backward move, its load of gas consumption, until the highest peak reached in December has become considerably more elevated than that of the previous year. The gradatory lines speak more eloquently than words of enthusiastic management and enlightened methods of development. The scale for 1897-8 tells a far different tale to that of 1901-2. The former delineates the easy-going and peaceful character of the business five or six years since. The succeeding year shows the beginning of increased energy; and 1899-1900 the almost sudden and substantial effect.

The year ending with June 30, 1901, saw the introduction of the electric light in Ilford; and the low point reached by the scale in May—the lowest point of that particular half-year—is the time when the Local Authority started business in electricity supply. But look at the scale for the six months from June to December, 1901! It goes careering away on its upward course with even increased vigour; and the signs of a competitor having come into the field cannot be traced. But the descending line from December to June 30, 1902, with the marked curve in the dropping consumption—quite distinct from the previous years' records—indicates something unusual having happened. That curve in the line marks the period when 600 public lamps were transferred from gas to electricity. Still—notwithstanding this large slice being taken from the old business—the total consumption of gas was well maintained above that for the corresponding period. But the line for the second half of last year—the last on the diagram—bears testimony to the wonderful recuperative power of the gas supply of the district. If any line more than another should have shown an erratic course, it should have been that one—in view of the electric competition, and the loss of 600 public lamps. But the contrary is shown. There is not another line for any corresponding half year that exhibits such a direct upward flight as this one. With one little exception at the beginning of the half year, there is not a single break in the continuity of ascension; and it gives the line for the previous year a wide berth. Although the record stops short with the week before Mr. Brown removed from Ilford in December, the line has left the high peak that was reached in December, 1901, well behind. The diagram affords an instructive study; and we heartily recommend it to the notice of the "false prophets" of the electrical industry and to those who fear for the future of the gas industry.

"PETROGENE" AIR GAS TO REPLACE DEAR COAL GAS.

THE title chosen for this article directly hits the proposal which strikes us as being somewhat novel and appeals for most consideration in connection with the plans laid down by the Petroleum Gas Syndicate, of 28, Victoria Street, S.W., in the exploitation of their "Petrogene" carburetting process. How far it will accomplish the object is, of course, a point that only the future can determine; and we are debarred from hazarding anything approaching a conclusive opinion upon the matter from the mere fact that as yet the system has not been substituted for the general supply of a district in which, through various circumstances, coal gas can only be supplied at a dear rate. But the Syndicate have complete faith that their proposal is capable of profitable achievement with their ingenious plant—so much so, in fact, that our advertisement columns bear witness to their willingness to erect complete installations of the plant (not exceeding 2000 lights) for gas companies, local authorities, and others, on co-operative terms, without disturbing, during installation and trial, the existing lighting system. At present, it is seen, the Syndicate do not court very big things; but simply those country districts and villages the conditions of which, with the comparative small consumption, are opposed to a cheap coal-gas supply. The avoidance of extravagant pretensions and designs on the part of the projectors make us the more willing to direct attention to their system and this particular scheme.

It is almost a matter of orthodoxy with some gas managers that the gas they are called upon to supply cannot, or must not, ever be produced from anything but coal; it has become to them an accepted belief through early training and a working-life's usage. By such managers we may be charged with something not far short of heresy in saying that they are wrong. Water gas has been with us for years; and millions of cubic feet are daily being poured into the gas-distributing mains in this country. Oil gas, too, is in constant use in small country installations. Producer gas, made from material other than the high-grade coal used in ordinary gas manufacture, is already employed very largely in industrial places, and will ere long be distributed from immense producing centres. And if all these departures from the former order of things, why should the general supply of carburetted air gas be outside the range of possibility? Professor Lewes tells us it is not. For some few years past, in the village of Breukelen, in the Pays-bas, there has been an installation, supplying through about 2 miles of mains, on an older system than that now under notice. In recent issues of the "JOURNAL," too, we have referred to other Continental installations—one for 1200 lights near Buda-Pesth; and now we are informed that an installation of nearly 100 lights on another system has been in use on the Great Western Railway at Kemble Junction. Time naturally brings improvement, and the system of carburetted air gas production is no longer conducted in the trumpery and crude manner of a quarter of a century ago. The methods of to-day are constructed on scientific and engineering foundations which give gas reliable and constant and suitable—more especially with the incandescent burner—for lighting, heating, and motive power. It is, in fact, the introduction of the incandescent burner that has given an impetus to this form of gas manufacture, that has altogether changed the character of the producing plant, and that has made it worthy of more consideration than the old plant of some years since. Of course, the field for the "Petrogene" system is not limited to the one to which we have referred; but it is also applicable for the lighting of large railway stations, factories, mansions, and so on, where a sufficiently large number of lights are required to justify the expenditure on a plant of the kind. In these directions—though not by any means in all cases—the process might come in as a competitor of existing gas supplies; and therefore, naturally we are inclined to regard its application more in connection with the suggestion that it should be adopted by gas makers in small districts as a means of producing and

offering a cheaper supply than at present to their customers. Here again, until practical experience comes to our aid, we can do nothing more than put forward the data supplied by the Petroleum Gas Syndicate for the consideration of our readers.

But before presenting these figures, it may be well to give a little information as to the "Petrogene" gas itself, and the character of the apparatus, which has been designed and patented by Mr. Henry Garde, of 3, James Street, Haymarket, S.W. Its name discloses generally the composition of the gas; and, from what we have seen of its performance, we can do no other than accept and apply in this instance the statement that Professor Lewes made in his recent Cantor lectures that "air carburetted with the vapour of light petroleum yields an illuminating gas of considerable value." In connection, however, with carburetted air gas, the great difficulties of the past have been (1) considerable condensation in the pipes; and (2) variation of density dependent on the atmospheric temperature, the quantity of gas manufactured, and the length of time the apparatus is working—that is to say, the gas is rich in summer and poor in winter; and, generally speaking, rich at the commencement of the period of carburetting and when few lights are burning, growing gradually poorer as the carburetting continues and more lights are put on. In the "Petrogene" process, the first difficulty has been surmounted by manufacturing the gas without recourse to any artificial heat—an essential feature, it is pointed out, of the system being that the gas is always manufactured at a lower temperature than that existing in the pipes through which it passes, with the result that no condensation whatever takes place. In a large installation, it is proposed to dry the air before admission to the apparatus, in order to give it as large an oil-carrying capacity as possible; and, under the conditions to which it is subjected in the apparatus, it appears impossible for it to become saturated to such a degree that there would be condensation at the temperature to which it would be exposed in an ordinary distribution system.

But we have more bearing on this point in dealing with the second difficulty, which is the more formidable. It is a well-known scientific fact that the rapid evaporation of any liquid is accompanied by a reduction in the temperature of the liquid. Now the manufacture of this gas, no matter what means are employed, is, in effect, the evaporation of pretroleum; and, being so, there must be a certain amount of heat lost. It is also a well-known fact that the ease of evaporation of any liquid is reduced with the temperature of the liquid. These facts make it at once apparent that the great difficulty in the manufacture of carburetted air gas has been to maintain it at a constant density. In most of the appliances and machines designed up to the present, various means have been tried to get over this difficulty —chiefly by applying heat to the carburettor, to replace that lost in the carburetting or manufacture of the gas. This, however, really leads to difficulty. because the gas, being manufactured at a high temperature, begins to condense almost immediately in the pipes. Other means have been to use very large quantities of petroleum so as to minimize as much as possible the reduction of temperature; but, we are informed, these also have been found impracticable. In the "Petrogene" plant, the difficulty has been overcome by simple means—consisting of: (1) Provision for increasing the height of petroleum through which the air passes in the carburettor; the density of the gas depending upon the period of contact between the air and the petroleum. (2) A constant circulation of petroleum between the carburettor and a reservoir, by which an equable temperature is maintained in the former. (3) Means of utilizing the heat caused by compressing the air and the friction of the working parts of the machine, in order to compensate for the heat lost in the carburetting. (4) The protection of the carburettor from sudden variations in atmospheric temperature. The result of these improvements in the manufacture is, the inventor tells us, that a gas is produced of constant density, which can be regulated to suit any burner, heating apparatus, or gas-engine. In conjunction with the plant, it may here be conveniently mentioned, a density-meter is supplied, by which the attendant is able, by an occasional reference to the pointer travelling over a graduated scale, to keep the gas of uniform constitution.

The description of the plant is an easy matter; and its construction will be readily understood by a little explanation and reference to the accompanying drawings. Its main features are an air-compressor, a carburettor, and an oil reservoir. The air compressor is divided into two chambers: The air-chamber B and compressor chamber C. In the air-chamber is fixed a hollow drum, revolving on a spindle, actuated by a driving-wheel. On the drum are coiled four tubes, each of which is given at least one-and-a-half revolutions round the drum, and has an end open on the outside and inside of it. There is also an opening from the drum into the compression chamber. The carburettor D contains, fixed through the bottom, a small pump connected with the drum spindle (which passes into the carburettor and through the compression chamber) and also with a suction-pipe passing to the extreme left of the reservoir A. A moveable overflow-pipe leading into the reservoir, and worked by an outside lever, is also fitted in the carburettor. A pipe passes from the compression chamber into the carburettor, terminating in a finely perforated ring or coil at the bottom. The compression chamber and carburettor are closed by manhole covers, and the air-chamber by an ordinary lid with an open air-inlet. A filling-pipe is provided for the reservoir, and the carburettor has a gas outlet-pipe. A shallow tunnel runs from the compression chamber under the carburettor into a narrow channel or jacket passing round the carburettor and along the sides of the compression chamber to the air chamber.

The method of working the plant is as follows; The reservoir and carburettor are filled with oil; the quantity in the latter being regulated by the overflow-pipe. The air-chamber is filled with water or other suitable liquid to nearly the level of the spindle; the compression chamber becoming filled to the same level through the connecting channel and tunnel. The driving-wheel is then set in motion. As the drum revolves, the tubes dip into the liquid, which passes through them into the drum, driving before it the air in the upper part of the tubes. A constant stream of air and liquid is thus delivered into the drum, and thence into the compression chamber, where, the liquid acting as a seal, the air is compressed; the surplus liquid passing through the connecting tunnel and channel back into the air-chamber, thus setting up a constant circulation of the liquid. The pump and overflow-pipe in the carburettor at the same time maintain a similar circulation of oil from the reservoir. The compressed air passes into the carburettor through the perforated ring or coil, and is forced up through the oil, with which it becomes impregnated, and is delivered through the outlet-pipe into the gas-mains. As stated, the quantity of oil in the carburettor is regulated by the overflow-pipe, which can be raised or lowered at will; thus providing simple means of regulating the density of the gas, by increasing or reducing the column of oil through which the air is passed as necessity arises. The water-jacket and circulation afford protection against sudden changes in atmospheric temperature; at the same time maintaining the temperature of the carburettor by conveying to it the heat generated by the compression of the air and the friction created by the revolving of the drum to afford compensation for the heat lost in the carburetting. Furthermore, by the process of pumping and circulating the oil between the reservoir and the carburettor, a constant fresh supply of oil, of practically even temperature, is maintained in the latter. The power necessary to work the plant is very small. A $\frac{1}{20}$-horse power hot-air or water motor is quite sufficient for a 100-light plant; while similar plants up to 50 lights can be worked by weights. Large plants for 1000 lights and upwards can be most economically operated by engines, for which the gas as made is suitable.

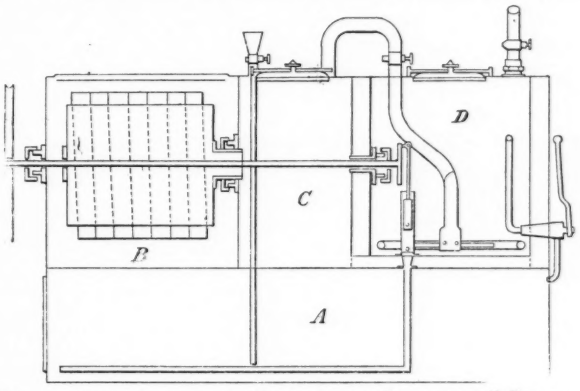


FIG. 1.—SECTION THROUGH CENTRE OF "PETROGENE" PLANT.

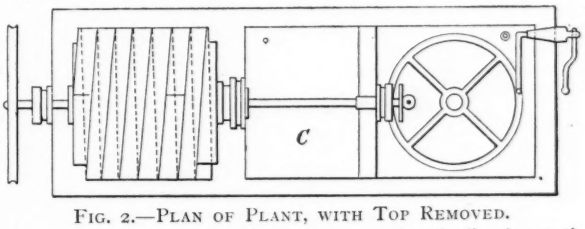


FIG. 2.—PLAN OF PLANT, WITH TOP REMOVED.

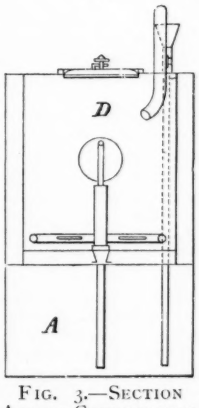


FIG. 3.—SECTION ACROSS CARBURETTOR (BEHIND PUMP).

A small plant (equal to 50 or 60 lights), as here described, is to be seen in operation at the premises of Mr. C. E. Masterman, of No. 28, Victoria Street, S.W.; and from it are supplied a range of burners of all descriptions—incandescent, flat-flame, and argand, and the efficiency of the gas can be tested by them. The plant is compact and simple, and requires little attention. From the information afforded during an inspection, it cannot be said that the cost of installation is by any means expensive, particularly considering the gas-producing capacity. The inventor, it was gathered, prefers to run the plant (which in the case of a small district supply

should for safety be in duplicate) according to requirements, and supply direct into the mains, without the intervention of a large storage holder. A small holder is recommended, where a gas-engine is employed for the driving of the drum, for storing sufficient gas to start the engine, and afford a reserve when changing on to the duplicate plant if necessary. The small amount of power required for operation is readily demonstrated by this plant. It was learnt that the petroleum used has a specific gravity of ·680; and that to produce an illuminating power equivalent to 1000 cubic feet of 16-candle coal gas, only 1½ gallons of petroleum spirit are required. The air enters the carburettor at a pressure of about 10 inches, which the passage through the oil reduces to about 5 inches. A governor on the outlet-pipe from the carburettor is used for regulating the pressure as desired. The gas, tested in the usual manner, has an illuminating power of about 12 candles. With incandescent burners, however, photometrical tests show that an illuminating power equal to 25 candles per cubic foot of gas is obtained; so that, with a consumption of 2 cubic feet in an ordinary "C" burner, a good result is realized. In our view, the Kern burners in use with the demonstrating plant were giving even superior results. But the pressure of the gas has a marked influence. At the commencement of the inspection, it was being supplied to the burners at a pressure of 2½ inches; but an addition of 5-10ths had a very distinct improving effect upon the light obtained. The flat-flame and argand burners do not show so favourably as the incandescent burners, but still they give a good result for a 12-candle gas. Carburetted air gas undoubtedly carries with it, as a necessary to the securing of excellent lighting, the employment of incandescent burners; but, in saying this, we do not by any means suggest it as a disadvantage. The burners do not require any special adjustment; and ordinary gas-meters are also used—in fact, in every respect the fittings are the same as for coal gas.

Now, regarding the important point as to cost. In the following comparative statement (which was handed to us for publication), it will be seen that the gas is taken at the high figure of 5s. per 1000 cubic feet. But it is necessary to read in conjunction with the table the succeeding explanation.

Cost of a 50-Candle Power Light for One Year of 1500 Burning Hours, Compared with Electricity, Oil, and other Gases.

	£	s.	d.
Electricity at 3½d. per unit	4	7	6
Oil at 8d. per gallon	2	5	0
Coal gas at 3s. per 1000 cubic feet—			
Flat-Flame burners	5	12	6
Argand burners	3	15	0
Incandescent burners		15	0
Oil gas (oil at 4d.)	1	17	6
Acetylene at 40s. per 1000 cubic feet	3	16	0
"Petrogene" gas at 5s. per 1000 cubic feet		15	0

From this it will be seen that "Petrogene" gas at even 5s. per 1000 cubic feet is cheaper than the other forms of lighting excepting coal gas at 3s. used with an incandescent burner, and in this case the value is equal. In the manufacture of 1000 cubic feet of the gas, 3⅛ gallons of petroleum spirit are consumed. The price of the spirit in small quantities is 9d. per gallon; but this figure would be considerably reduced by purchasing in larger quantities. It may therefore be taken that "Petrogene" gas will cost 2s. 6d. per 1000 cubic feet to produce; but as we are told that 1000 cubic feet of this gas are equivalent to about 1700 cubic feet of coal gas, both for illuminating and heating purposes, it follows that the relative cost of production is only 1s. 6d. per 1000 cubic feet.

This brings us back, in the concluding paragraph, to the point at which we started this article—that is, the proposal that this system should supplant coal-gas plants in small districts where the present gas supply is expensive. It is pointed out to us that in a recent publication details are given of 387 towns in Great Britain where coal gas is from 4s. to 5s. per 1000 cubic feet, and 554 towns where the price is from 5s. upwards; the aggregate consumption of gas being approximately in the first case 5,344,000,000 cubic feet, and in the second case 2,363,000,000 feet per annum. In addition, there are several towns (from which no returns are made) where coal gas is at very high prices. In very many of these towns, the adoption of "Petrogene" gas would, it is held, result in a reduction of price of gas to the consumers and increase of profits to the gas proprietors. There are also numerous towns and villages where there is no system of gas lighting, which would afford an immediate opening for the gas. We prefer that readers should make their own calculations on these figures; and those who are directly interested may then pursue their inquiries further on their own account. It is alone the novelty of the proposal as to the substitution of the process for coal gas, where the conditions favour the change, that has led us to go to this length in describing the system. There are other points to which our attention was directed, but which the extent of this article forbids us entering into now. When a large installation as projected is made, then we shall be happy to give full consideration to the practical experience gained, and to publish the results. Another small plant is, we are informed, to be seen in operation at 38, Westmoreland Street, Dublin.

Much sympathy has been manifested with Mr. J. L. Wilkinson, the Secretary of the Portsmouth Water Company, in the severe bereavement he has sustained by the death of his wife, which took place at their residence at Southsea on the 24th ult.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 300.)

THERE was no increase last week in the rate of activity of business on the Stock Exchange. The chief feature was the fortnightly settlement, which was not an unusually heavy one, though it was not altogether unattended with difficulties. There was no marked tendency—things being inclined to waver, sometimes brightening up and then falling dull again. Changes of prices are about as many in one direction as in the other. In the Money Market, there was a brisk demand in connection with the Stock Exchange settlement and other requirements. Much disappointment was expressed in some quarters that the Bank of England rate was not lowered on Thursday. In the Gas Market, the general trend of business was much the same as in the preceding week, being very largely confined to the issues of one undertaking only. In these, there was considerable activity on the whole, though it was irregular, a brisk time one day being succeeded by a calm the next. Changes in quotation are few and for the most part slight; but the greater part of them are in the lower direction. In Gaslight issues, the ordinary opened strong, and changed hands more than once at 89½. A revulsion of feeling set in, however, and it fell to 88. On Friday it marked 87½ once, and closed at 88 on Saturday—the quotation having fallen one point. The secured issues, too, moved irregularly. The preference dropped half-a-point and the debenture a full point; while the maximum gained one. South Metropolitan was decidedly quiet, but very firm—indeed, it looked good enough to bear a rise. In the Suburban and Provincial group, there was not a single transaction during the whole week, and quotations were left standing unchanged. Perhaps in a week or two when their accounts for the last half year are issued, some movement in them may be stimulated. Business in the Continental Companies was of the very smallest proportions. There were three bargains in Imperial, but none at all in European. Union was done once at the low price of 128; and the quotation went down four points accordingly. This stock now figures among the cheapest on the list—a marked contrast to what it once used to be. There was nothing noticeable in the remoter undertakings, beyond a little advance in River Plate debenture. The Water Companies continue to be extraordinarily inactive, and quotations are quite unchanged, except that New River debenture is *ex div.*

The daily operations were: On Monday there were brisk dealings in Gaslight ordinary at good figures; but the debenture stock fell 1. Tuesday was quieter. Gaslight maximum rose 1; but the ordinary receded 1. Wednesday's business was about the same. Continental Union dropped 4. Thursday was very quiet and unchanged. Friday was steady generally; but Gaslight preference was ½ lower. Quotations closed on Saturday without further alteration.

PERSONAL.

At the meeting of the London County Council last Tuesday, the resignation was announced of Mr. HENRY LAWRENCE CRIPPS, who has been their adviser on parliamentary matters ever since the constitution of the Council, and who previously acted in this capacity for the Metropolitan Board of Works. Mr. Cripps has become the senior member of the firm of Messrs. Dyson and Co., who will continue to conduct the Council's business as Parliamentary Agents. At an emergency meeting held by the General Purposes Committee, while expressing their deep appreciation of the excellent service rendered by Mr. Cripps to the Council and to London, they enumerated the important measures carried by him through Parliament; and special mention was made of his conduct of the Council's case on the London Water Question before two Royal Commissions and before Parliament on several occasions.

At the invitation of the Chairman and Directors of the Cromer Water Company, a select party dined together at the West Cliff Hotel on the 17th ult., on the occasion of the presentation of a testimonial to Mr. P. E. HANSELL, the Secretary. The Chairman (Mr. J. Lovelace) presided, and spoke in warm terms of the great services Mr. Hansell had rendered to the Company. He expressed the regard and respect felt for him by the Directors, who hoped he would be long spared to look upon the present he was about to ask him to accept, and think of the days which had gone by. He then handed to Mr. Hansell a silver salver, bearing the following inscription: "Presented to P. E. Hansell by the Directors of the Cromer Water Company, in recognition of twenty-three years' devoted service as Secretary to the Company. Christmas, 1902, James Lovelace, Chairman." Mr. Hansell, in acknowledging the gift, said he had always endeavoured to do his duty to the Company; and he cordially recognized the able assistance he had had from Mr. Frost, the Manager, in carrying on the work. He felt that no higher praise could be given than that bestowed by one of the Arbitrators in connection with the transfer of the undertaking, who said he never knew such a gold-mine carried on for twenty years with so little capital and such small expenditure in working. He hoped it would turn out as good a gold-mine to the Cromer ratepayers as it had for so many years to the Company.

LAW RELATING TO RIVER POLLUTION.

In view of the extent to which rivers and streams are depended upon as sources of water supply, the necessity for keeping them as free as possible from pollution does not require emphasizing at the present day. Years ago this was a matter which was to a large extent disregarded, owing to a very widely-spread belief in the self-purifying power of rivers—water which would make a by no means bad substitute for ink when passing through a manufacturing town being found comparatively clear and limpid some few miles lower down the stream. On the other hand, there were many who held tenaciously to the opinion that a river once polluted was always polluted; and this led to a demand for special legislation having for its object the exclusion from streams of matters which were regarded as being inimical to their utilization in the service of the community. The passing of the Public Health Act in 1875 and the Rivers Pollution Prevention Act in the following year ought to have produced a very marked improvement in the condition of our rivers. But the Royal Commission on Sewage Disposal had to confess, in their interim report, that the latter measure had not resulted in the general purification of streams; and the opinion was expressed that a new department of the Local Government Board—a supreme rivers authority—should be created. Assuming this were done, the officials would in all probability make it their first business to frame regulations setting forth what should and what should not be allowed to pass into a river; because it is not improbable that some misconception exists on this point. One thing, however, is quite clear—that, by the terms of the later of the two Acts above cited, District Councils have had placed upon them the onus of preventing the contamination of water by noxious discharges. Though this has been brought home to them in various ways, it appears that the question of the pollution of the sources of water supply all over the country—whether springs or rivers—has never yet been considered as a whole from a legal standpoint. This Mr. Vesey Fitzgerald has done in the book which, as already mentioned in the "Journal," he has recently published.*

The object of the author, as he tells us in his preface, has been to collect the statutes and cases bearing on the subject, in such a form as to enable those interested to ascertain the law relating to any questions that may arise, and to appreciate the changes effected by modern legislation. The thoroughness of his research may be gathered from the statement that the earliest case cited is that of *Dewill v. Saunders*, in 1618, in which it was laid down that no right to cause a public nuisance can be granted by anyone, or be acquired by prescription. The others, with a very few exceptions, were decided in the past century; and there are several pages of them. The general subject is introduced with some remarks on the common-law rights relating to water, which depend primarily upon the ownership of the land in or upon which the water is, or through which it flows; and they vary according as the water is stagnant or runs in a stream. Water which "does not flow in a stream, and is not connected with one by any known channel," belongs absolutely to the owner of the land where it is found; and he may do what he pleases with it, provided he does not injure his neighbours. The author proceeds to deal with springs and wells, natural and artificial streams, the rights of riparian proprietors, and other matters, and then passes on to treat of easements. The next part of the book is devoted to a review of the several statutory provisions, starting with the disposal of refuse in former times, when the practice of getting rid of it by turning it into the nearest river was looked upon as perfectly natural and proper. This state of things was, however, altered by the Public Health Act, 1875, and also by the Rivers Pollution Prevention Act, 1876, though, as already pointed out, the benefit resulting from the passing of these measures has not been so great as was anticipated. Having indicated the provisions enacted for preventing the pollution of rivers, Mr. Fitzgerald goes on to show how they may be put in force. He explains the difference between public and private nuisances, and deals successively with indictments and injunctions, procedure under the Act of 1876 and under Local Acts, and the jurisdiction of County Courts and Courts of Sewers. This completes his summary of the various rights and remedies given by common law and statute with reference to the pollution of rivers and water generally. He acknowledges that it is incomplete, but he does not claim more for it than an attempt to "put the reader on the track of the cases and of the sections of the Acts of Parliament bearing on the question on which he desires information."

The remainder of the book consists of the sections of the Acts above referred to which are considered to be of general importance, accompanied by notes showing the interpretation put upon them by the Courts. Here will be found certain sections of the Water-Works Clauses Act, 1847, and necessarily some very full extracts (occupying upwards of 50 pages) from the Acts of 1875 and 1876. In an appendix, a list is given of the more important Private Acts dealing with the pollution of rivers and canals, together with two circular letters from the Local Government Board—one bringing under the notice of the sanitary authorities the provisions of the Act of 1876, and the other calling attention to those of the Rivers Pollution Prevention Act, 1893. The text is followed by a valuable index, compiled for the author by his friend Mr. R. A. Glen, of the Western Circuit, who also assisted him in passing the work through the press. This was no light task, in view of the large number of references contained in the text. The result of their combined labours has been the production of a book packed full of information, the authority for which is always given; and it cannot but be of the greatest value to all who are interested in the special subject of which it treats.

* "The Law Affecting the Pollution of Rivers and Water Generally." By J. V. Vesey Fitzgerald, K.C. London: Knight and Co.; 1902.

COMMUNICATED ARTICLE.

DIFFICULTIES WITH GAS-FIRES.

By Thomas Fletcher, F.C.S., of Warrington.

We have had an experience with gas-fires which is evidently not unique, but which has not hitherto been satisfactorily explained. One of our bedroom fires, which has been ample for a room 24 ft. by 16 ft., with two very large windows, was removed to a spare bedroom little more than half the size, with the surprising result that it was practically useless except for a small space within the reach of the powerful radiant heat; the air-warming arrangement being, if anything, worse than useless. Some trials proved that an excessive chimney draught caused all the trouble, which was cured by fitting a sheet of iron over the opening, with a hole for the flue, which also was half closed by part of a brick.

The other case was more curious; and it was some weeks before the cause of the trouble was found and remedied. In this case also the chimney draught was very strong; but a gas-fire had been used for a long period with perfect satisfaction. It was changed for one of a different pattern, more in accordance with the general design of the room; but, although of the same class, and rather more powerful, it was a total failure—not warming the room, burning white and smoky, and when turned down going out altogether, as it could not light-back. After trying it in various positions, in all of which, except where it was wanted, it was perfectly satisfactory, I came to the conclusion that the fault was probably due to the fact that the back of the casing did not reach the hearth, and that the draught underneath interfered with the burner, although the latter was specially protected by a casing open in front only. This proved to be the cause of all the trouble. The draught of the chimney was so strong that it actually pulled part of the gas out of the burner, along with most of the air; causing a considerable escape of unburnt gas directly up the chimney, and, when turned low, taking all, both gas and air, thus preventing the burner doing anything. With an ordinary burner which could have lighted-back it could not be lighted at all unless under the heaviest gas pressure; the slightest attempt to turn it down causing lighting-back instantly. In this case, the closing of the part between the back and the hearth with a strip of sheet iron remedied the fault at once, and there has been no further trouble. The upper part of the fireplace has been left open, as in this room free ventilation and a fresh, sweet atmosphere are more important than economy; otherwise we should have treated this case in the same manner as the first one.

The difficulty is not new to us; but it is the first time we have been able to clearly locate the fault and its cause. I have no doubt the same thing has occurred with many fitters, without the cause and the remedy being found; and therefore the experience related above may be found useful when similar cases are met with. In the earlier forms of gas-fires, no attempt was made to protect the burner; and the fault was not at all unusual. But for many years past a special draught-guard has been fitted to most, if not all, gas-fires, with a satisfactory result; and it is evident that, in future, all gas-fires will have to be made with a back which entirely prevents any under-current of air.

The Inverted Gas-Lamp in America.—In the "Journal" for Sept. 2 last, there appeared a description of the new inverted incandescent gas-light. The rights in the lamp in the United States have recently been acquired by Dr. E. Y. Ames, Mr. Arnold Heller, and Mr. Bankson Taylor, all of New Orleans; and a Company has been organized, with offices in New York, to manufacture and sell the lamp. It will be remembered that the lamp is the invention of Messrs. Bernt and Cervenka, of Prague; and, in view of the extended notice already given to it in our columns, further reference is unnecessary.

Economizing Coal.—Mr. George Beilby, a Past-President of the Society of Chemical Industry, gave evidence before the Coal Commission last Wednesday as to the great waste of coal involved in the present methods of producing heat and power. He expressed the opinion that there is enormous scope for economy in many directions, but more especially and more obviously in the substitution of gas-producers and gas-engines for the average steam-engine and boiler. In this way alone Mr. Beilby estimated that something like 40 million tons of coal a year might be saved in the production of power. On the same occasion, Colonel Sadler, M.P., gave some interesting details as to coking-ovens, with and without the recovery of bye-products.

TECHNICAL RECORD.

WEST'S COMBINED CHARGING AND DRAWING MACHINE.

The works of the West Gas Improvement Company at Miles Platting, Manchester, were visited last Friday by a second party of gas engineers from various parts of the country, for the purpose of seeing in operation West's combined drawing and charging machine, of which an illustrated account was given in the "JOURNAL" for Dec. 15.

After the trial, Mr. John West pointed out to those present, the advantages of the machine, especially when operated on a limited number of retorts. This they had not hitherto been able to do so economically by the use of power; but for the future they would be able to apply the power machinery as economically to a small number of retorts as to a greater number. Since the first time the machine was exhibited to engineers (though only a few weeks ago), he had made some improvements which he saw were needed; the principal being an automatic arrangement, by which the scoop delivering the coal into the retort was compelled to discharge the coal by first turning to the right, and then to the left. This was necessary, as he found that men actuating the machines from time to time turned both scoops in the same direction. There was no doubt now the layer of coal would, without fail, be equally distributed over the whole floor of the retort.

Mr. West having replied to many questions put to him by the engineers present, Mr. W. A. Valon on behalf of the visitors said they all felt indebted to Mr. West for the opportunity he had given them of seeing in operation what he thought might rightly be considered the most advanced power machine in existence at the present time for the charging and drawing of retorts; and he thought he might also endorse what Mr. West had said—viz., that, having regard to cost and efficiency, it would make competition with horizontal retorts difficult, if not impossible, by retorts operated by any other system. He (the speaker) had had the opportunity of seeing Mr. West's first experiments at Maidstone in connection with charging and drawing machinery, and had consequently followed the successive development of the machine from that time to the present with special interest—the more so as he had as opportunity afforded adopted it for drawing and charging retorts in a large number of works, which enabled him to speak with confidence as to its efficiency and economy. From time to time West had improved upon West, until he had produced and put into their hands a machine which, judging from the point of a practical gas engineer, they could see was very far in advance of anything that had yet been placed upon the market; and Mr. West might rightly be sanguine as to its future success. As Mr. West had said, comparisons between systems were only misleading, unless they were made with care, and without mixing or confusing the operation of carbonizing the coal with other devices which were equally applicable to coal carbonized under all systems. In other words, they ought to compare like with like, by taking the actual weight of coal carbonized per man per hour per foot run over a given area of retort, per pound weight of fuel used in carbonizing that weight within a given area by per pound in money of the constructive cost necessary to complete that operation—that was to say, the moment of judging the work done should be taken from the entrance of the coal into the retort until its discharge into the conveyor taking the coke from the retorts, and equally the capital outlay to accomplish this operation. Before and after that moment, all comparisons should be relegated to other standards than that of cost of carbonizing. Necessarily, this machine might be applied in a great number of cases to existing retorts without alteration; and in any case to retorts set on the horizontal principle at the usual cost per mouthpiece for horizontal retorts, and would not necessitate increased expenditure for the erection of large masses of brickwork necessary for the setting of the retorts, nor of abnormally large houses to contain them. Another factor in connection with this machine also came into consideration—viz., whether it was possible to carbonize in any given section of retort per foot run anything like the weight of coal by a different system than could be carbonized by a horizontal retort by the aid of this or some similar machine doing equally good work, and the weight of fuel as against the coal carbonized. He thanked Mr. West, on behalf of the gentlemen present, for the information he had given them, and for his courtesy in allowing them to see the thing for themselves. They, as engineers, were much indebted to the energy, perseverance, and ability that Mr. West had shown in years past in the development of power machinery, but in none more so than in his latest production. He had asked about the cost of the machine; but Mr. West, quite rightly, did not wish to commit himself to a final figure until he had ascertained beyond doubt what he could afford to supply it at. However, he (Mr. Valon) thought, using his own judgment, the cost might be from £1800 to £2000. This meant an annual charge of £180 to £200 for a power machine to operate on from a minimum of nine to a maximum of eighteen beds, which meant a cost of £10 to £20 per bed per annum. This cost appealed to them as gas engineers to be positively negligible. The machine did not want cheapening; the cost having been reduced within reasonable limits. He did not think Mr. West need care so much for cheapening; but they hoped he would continue to devote his time to making such improvements from time to time as might be suggested by practical experience while working the machines.

Mr. C. E. Botley, of Hastings, remarked that he had pleasure in adding his testimony as to the valuable work which had been done by Mr. West for the gas profession; and he fully endorsed what Mr. Valon had already said. He was sure that in time to come Mr. West would reap the benefit of his untiring energy and application.

GAS-ENGINES FOR ELECTRIC LIGHTING.

A large party of members of the Birmingham Section of the Institution of Electrical Engineers recently visited the extensive works of the General Electric Company, Limited, which have lately been opened at Witton. The visitors were shown in succession over the engineering shops, the power-house, foundry, carbon works, and the building set apart for making steel conduits. After thoroughly inspecting them, with the assistance of the staff, they assembled at the Company's club-house, where they were entertained to tea. In the evening, they met at the University, under the presidency of Mr. Henry Lea, to hear a paper read by Mr. H. B. Graham, on "Gas-Engines for Electric Lighting."

The author began by pointing out that the ordinary commercial type of gas-engine was unsuitable for electric lighting purposes, whether the dynamo were coupled direct or belt driven, by reason of the excessive variation of speed between full and half loads. For continuous-current generators, however, the gas-engine could be so modified as to give perfectly good results; but for alternating currents, not one had yet been designed, so far as was generally known, which could be said to be even moderately satisfactory, and therefore the uneconomical expedient of driving in parallel had to be resorted to. The requirements were very exacting—the limit being a variation of speed of only 0·5 per cent. under varying loads. In ordinary gas-engines, the speed variation might be $7\frac{1}{2}$ per cent., and yet be unnoticeable, by reason of the reduction of speed through the secondary and tertiary motion shafts; but in engines supplied for electric lighting purposes—he was speaking then of continuous-current plants—such a variation would be unbearable. With a reasonable increase of speed between engine and dynamo if belt driven, or by an efficient elastic coupling if direct coupled, the speed variation might be kept within $1\frac{3}{4}$ or 2 per cent.; and under the maximum limit, the lights would appear quite steady, and might be considered satisfactory.

Passing on to deal with the fly-wheel problem, Mr. Graham expressed the opinion that fly-wheels were usually too light or too small in diameter—either conclusion amounting, of course, to the same thing in the end. For electric lighting purposes, it was necessary to increase the weight of metal in the rims, increase the diameter of the wheels, or increase both weight and diameter in moderation. To increase the diameter alone would be the most preferable method, since the weight required in the rims varied inversely as the square of the diameter. But the enlarging of the wheels was checked by the periphery safe velocity limit before a sufficient increase was attained. To increase alone the weight of the rims would be to raise the cost considerably, and at the same time decrease the mechancal efficiency of the engine by the increased inertia to be overcome. The most convenient method, therefore, was to increase the diameter of the wheels until the periphery of each attained a velocity of 85 feet per second, and then to add the required weight to the rims. In practice, however, it was found that the addition of weight to the wheels necessitated a crank-shaft of stronger proportions, which, again, required larger bearing surfaces in the journals. With new wheels, new crank-shaft, new brasses, and, in consequence, a new bed-plate, the ordinary gas-engine was, to all intents and purposes, a new engine; and it was doubtful whether it would not be cheaper and better to re-design it altogether from another standpoint.

The author went on to show that another point of difference between the low and high speed engine is in the way the crank and connecting-rod are balanced. On the former type of engine, the counterbalance is invariably cast under the rim of the fly-wheel; but for accurate balancing this method cannot be considered so efficient as the direct counterbalance studded to the crank-webb, and rotating at the same radius as the crank-pin—the centre of the weight to be counterbalanced. In hotels, private houses, hospitals, and even in many business concerns, comparatively undisturbed silence is a desideratum. For this reason, he said it was not always advisable to rely on air silencers and exhaust mufflers, but rather to place the engine—in fact, any machinery—in a separate outbuilding. In such cases, the main gas-cock in the out-building might be operated from the main building by means of a switch, the details of which he described. This arrangement obviated a regular visit every

evening to turn off the gas; but the ignition apparatus as usually fitted on gas-engines was still a source of possible annoyance, inasmuch as it was always liable to fail at an unexpected moment.

Notwithstanding its occasional failing, however, the fire-clay tube was, for many reasons, the most satisfactory. It could be heated sufficiently to fire the initial charge in less than two minutes, only required 2 or 3 cubic feet of gas per hour passed through a bunsen burner to remain incandescent, and two out of three would last for months with fair treatment. To prevent these stoppages, it occurred to him that the tube might be made useful before reaching its final stage of disintegration. The engine was fitted with an electric sparking ignition plug as an emergency stand-by. The ignition-tube supported a lever, which, on the collapse of the tube, fell through an arc of 15 degrees, and in so doing drew over a switch and completed the emergency circuit, and the engine continued as before, only the form of ignition was changed. The lever, in falling, also released an ignition-valve retainer, which kept this valve on its seat, and so prevented a leakage which would otherwise have been sufficient to cause the engine to stop, if it was under full load at the time, and turn off the bunsen burner. It also performed a third function in starting an alarm-bell placed in a convenient spot in the house.

Mr. Graham thought it unnecessary to say that no reciprocating bearing should be fitted to an engine without some means of adjustment to compensate for wear; yet he said that few gas-engine makers considered it necessary in the case of the cross-head pin, which had to bear the whole force of the explosion; and a bump was bound, sooner or later, to be heard (generally after the short guarantee had expired), and a new pin was then necessary. If it was argued that the pin was of twice the requisite strength before being split, it was evident that the piston was unnecessarily weighted by such a design. This detail was of particular importance in the case of engines used in connection with electric lighting, because the jar at each explosion was likely to cause annoyance to their purchasers. Much annoyance was also often caused, with engines required to run long hours without attention, by the faulty design or the bad arrangement of the automatic lubricators. It was surprising, to his mind, that the revolving dipper type of mechanical lubricator had enjoyed such general adoption, for it could not be considered either economical or even moderately satisfactory. He showed a method which he considered to be far superior.

The author next turned to a very important part of his subject—the quantity of gas consumed in gas-engines per unit of horse power. He said it had often happened that a gas-engine of moderate price, with a guaranteed consumption of 16·5 cubic feet per brake horse power, had been rejected in favour of one 20 per cent. dearer, with a consumption of 0·5 cubic foot less, without the purchaser ascertaining that the first guarantee was on a gas of about 550 B.T.U., while the latter was on a gas of 700 B.T.U. The advantage was, of course, entirely on the side of the cheaper engine. The engineer who made the selection was not seriously to be blamed for the error he made, judging him in comparison with his class. He could not implicitly accept the statements of either of the rival engine makers, for both unreservedly denied and contradicted all that the other had said. He could not learn much from the gas department, for they were unwilling to give the information desired. This was not a small matter, but one of the greatest importance to gas-engine users, whether the engines were employed to provide the motive power for generating electricity or to drive machinery of another kind; and yet consumers who burnt coal gas as fuel more than as an illuminant were content with the knowledge that it was of about 16-candle power. As they were well aware, the photometric value of a gas bore no fixed relation to its calorific value; for two gases, each of 16-candle illuminating power, might be capable of differing as much as 25 per cent. in their respective average calorific or heating powers. But this was not all, for gas taken from the same mains might vary another 25 per cent. within a few hours. A gas of 14-candle power might be of equal value for use in an internal-combustion engine to a gas of 17-candle power. Considering the large number of gas-engine users which were to be found in every manufacturing town, it was most surprising that, in what was supposed to be a scientific age, the calorific value of gas did not receive more attention. The matter was one of the utmost importance to electrical engineers, because the price per unit of electricity thus generated depended mainly upon the cost per calorie of the heat employed in the prime mover. Some day the consumer would awaken to this fact, and a calorific standard would be insisted upon instead of the present photometric standard. Mr. Graham went on to animadvert rather severely upon the quality and price of Birmingham gas; drawing comparisons between it and the gas supplied to Manchester. He pointed out that, whereas the latter cost 2s. per 1000 cubic feet, the consumers in Birmingham had to pay 2s. 3d.; while there was a difference in calorific value of 25 per cent. in favour of Manchester. These figures were, he said, sufficient to show that the state of affairs in Birmingham was far from satisfactory.

At the close of the paper, the author gave a description of the Junkers calorimeter and Mathot's indicator; and numerous diagrams and lantern slides of gas-engines, all of very small size, used for electric lighting purposes, were shown.

In the course of the discussion which followed,

The CHAIRMAN remarked that he had not found any difficulty with the gas-engines when proper fly-wheel arrangements were made; and he failed to follow the author in his allusions to fly-wheel proportions. He cited the case of a Westinghouse engine in the district driving an alternator satisfactorily, and said he thought gas-engine makers must follow the example of certain engineers and build vertical engines. He suggested the fly-wheel of the disc pattern, which was both lighter and cheaper than the ordinary wheel, giving the same momentum, and requiring no outer bearing. He was glad to see the speeds increased, and he thought this was a line of development. With regard to the noise of exhaust gas, he had fixed six exhaust-boxes, as fitted by Messrs. Crossley Bros., so that in each the gas came out at right angles to the admission pipe; and he found it most effective. He attributed the fall in the calorific value of Birmingham gas to the introduction of water gas. Gas-engine users were only getting about 93 per cent. of power for the amount they used to pay before water gas was introduced. It was most important to state the calorific value of the gas employed whenever tendering for an engine.

Professor BURSTALL said the author had not told the members much about gas-engines for electric lighting. Perhaps he had assumed that the construction of such engines was perfectly well known to all present. With regard to the statement that little improvement had lately been made in gas-engines, he (Professor Burstall) had learned more in the past twelve months than he had done for many years. The introduction of the Körting and Westinghouse engines, and the great engines of the Deutz and John Cockerill works, had all been witnessed in the past two or three years; while in this country several very large engines had been put up, and much experience obtained. The really interesting problem for the future was the construction of medium-sized engines—from 40 to 200 horse power, and from 250 to 1000 horse power—for electric lighting. He had recently seen plans for a 1000-horse power motor; and a well-known firm were prepared to guarantee one of double this power. All of these engines were for electric work, and embodied many principles not found in small motors. The introduction of multi-cylinder engines for horse powers above 250 was in order to get better speed regulation. If gas-engine makers wished to obtain any share of the work from consulting engineers for central stations, they must use four-cylinder engines, so as to give nearly an even turning moment. No engineer would look at a large engine unless he were confident that the speed regulation did not depend upon the fly-wheel.

Mr. BATE suggested two ways in which it was possible, even with small engines, to do with comparatively light fly-wheels for parallel running. One was that of regulating the voltage of a gas-driven dynamo by inserting resistances automatically into the shunt circuit at the moment of, or immediately before, every explosion; and the other was by increasing the speed, and not merely the number of cylinders—going up to such speeds as were in use in motor-cars. This would enable a very small dynamo with a large number of cycles per minute to be used; and the cyclic irregularity would be of very little importance.

Mr. C. A. SMITH said it was a matter of satisfaction to know that a certain firm of gas-engine makers were willing to quote for, and guarantee, engines of the two-cylinder tandem type up to 2500-horse power to drive alternators in parallel. By coupling two of these engines together—*i.e.*, with four cylinders on to the same shaft, with the alternator between them—5000-horse power could be developed in one unit.

Mr. GRAHAM, in reply, said he had purposely not dealt with the larger engines, as he hoped to be able at a later date to approach the subject. He entirely agreed with everything Professor Burstall had said. At the present time, a factory was being erected near Birmingham for manufacturing large engines. He thought Birmingham people were getting even less than the 93 per cent. value quoted by the Chairman in comparison with what they had some years ago. It was questionable if they got 80 per cent.

The members then proceeded to consider other matters.

GAS AS THE FUTURE MOTIVE POWER.

In the course of a lecture on steam-turbines delivered by Mr. R. M. Neilson, before the members of the Manchester Association of Engineers last Saturday, the question of gas-engines and of gas as the best motive power for turbines was introduced and discussed.

In concluding his lecture, which was, of course, mainly devoted to demonstrating the great advantages of the steam-turbine over other steam-motors, Mr. Neilson said that as gas-engines of considerable size were now coming into use for the production of large quantities of mechanical energy, it might be interesting to refer to them as rivals of the steam-turbine. In his opinion, the big gas-engine had come to stay. It did not, however, follow that it would displace the steam-engine in even the majority of cases in which the latter was used. Though he was not discussing the relative merits of steam and gas engines, he might mention that in one respect the large gas-engine as now constructed could never rival a steam-engine of the turbine type—that was to say,

in smallness of size for a given power. In proof of this statement, he gave the following table showing the relative weight and floor space occupied by gas-engines, as compared with steam-turbines:—

Nature of Motor.	Type.	B.H.P.	Approx. over all Length in Feet.	Approx. over all Breadth in Feet.	Approx. Weight including Fly-Wheel, if any, in Tons.
Gas-engine . .	Crossley	120	12	9	..
Steam-turbine .	De Laval	150	11*	4½	4¾
,, .	,,	300	15*	6½	8
Gas-engine . .	Körting	400	30	18	50
,, . .	Gasmotoren-Fabrik Deutz	500	44	18¾	119
,, . .	Cockerill, single cylinder	600	..	..	125
,, . .	Körting	700	41	23	127
,, . .	,,	1000	49	29	190
Steam-turbine .	Parsons compound	3000	29½	8¾	35

* Includes two broad-face driving-pulleys.

There would, he added, probably be a fierce contest in the near future between the steam-turbine and the gas-engine for use in large power-stations; and he was not going to prophesy which would have the victory. Time would show which was the fittest for the work. This, however, was an age of "combines;" and the fight between the turbine and the gas-engine might possibly end in the two being merged into one.

In the discussion which followed, Mr. Barker, who for many years had been connected with the Parsons Turbines Company, said he had great hopes that they might be able to design and produce a gas-turbine; and they would then have a motive power that nothing in the world could beat. Mr. C. Rigenbogen, of the British Westinghouse Company, said they were building at their Manchester works gas-engines to develop 15,000-horse power in two cylinders; and in weight of engine for power developed, they were doing better than their competitors on the Continent. Mr. Coster said he had taken out a patent for a gas-turbine; but he had not been able to attain what he anticipated. The exceedingly high temperature was a great difficulty; and he was doubtful whether, with the delicate mechanism of the turbine, they would be able to find a material that would successfully withstand it. There were two points of importance in comparing the gas-engine with the turbine; one being length of run. He might mention that they had run a gas-engine night and day for five months, and from a month to six weeks was quite a common thing. After all, the question of the weight of the engine and the space occupied, though important, was not the matter of greatest moment affecting the merits of the particular type of motor. The main question was the fuel consumption; and in this respect there was no motor that could touch the gas-engine. Mr. Tritton said he had turned his attention to the construction of a gas-turbine. The high temperature was, no doubt, a stumbling block in the successful designing of this class of motor; but it was a difficulty which he felt certain they would be able to overcome.

INSTALLATION OF A LARGE KÖRTING GAS-ENGINE.

In regard to the paragraph which appeared in the "JOURNAL" for the 20th ult. (*ante*, p. 180), to the effect that the Power Gas Corporation have secured a contract for a Mond gas plant for Messrs. J. & H. Robinson, Limited, of the Deptford Flour Mills, Greenwich, it may be stated that the mill (a large and finely equipped one) is at present driven by steam-engines, which are now to be superseded by a 500 brake horse power two-cycle double-acting gas-engine, which will be constructed by Messrs. Mather and Platt in Manchester, under licence from Mr. Ernst Körting. Steadiness of turning moment, and reliability for continuous running, are of the greatest importance in a flour mill, when work is carried on from Monday morning till Saturday night without a stop; and Messrs. Robinson, after a careful and intelligent survey of other gas-engines, have concluded that the Körting type best fulfils these requirements. The engine in question will develop all the power in one cylinder, and will be coupled direct to the mill-shaft through the medium of a Mather and Platt patent friction clutch-coupling, capable of transmitting the full power developed. Though the two-cycle double-acting engine has, on account of its design, greater capacity for starting against some degree of load than a single-cylinder "Otto" cycle engine, it is advisable to instal suitable friction-clutches, which will allow the greater portion of the load to be applied after the engine has attained its normal speed. The design of the Mather and Platt coupling permits of this being done most effectively and safely. The producer plant will be supplied by the Power Gas Corporation, and will be suitable for a total output of 1000-horse power. On account of the comparatively small size, this plant will not be equipped with accessories for the recovery of sulphate.

HIGH-POWER AND OTHER INCANDESCENT GAS-BURNERS.

The following is an abstract translation of a paper, already briefly reported in the "JOURNAL" (see Vol. LXXX, p. 146), which was read by Herr H. Drehschmidt, the Chemist of the Berlin municipal gas undertaking, at last year's meeting of the German Association of Gas and Water Engineers. The paper has been published *in extenso* in a recent number of the "Journal für Gasbeleuchtung."

The contest between electricity and gas has been going on for some years, and at one time it appeared as if electricity would win and ultimately completely drive out gas as a means of lighting. The discovery of the incandescent gas-light, however, changed all this; and in point of brightness and cheapness, the electric light can no longer compete with gas-light. In one respect, however, electricity had the advantage over gas, or rather over the incandescent gas-light—namely, in the production of high-power lights for the lighting of large spaces, halls, salons, restaurants, cafés, squares, &c. But here, also, the incandescent light has begun to make its way. Of the many inventions and contrivances with this object which have appeared in Germany, and are tolerably well known, the "Hydro-Pressure" gas-light of Rothgiesser and the "Kugel" or ball light of Salzenberg may be mentioned. The hopes entertained of them have, however, not been fulfilled. The former requires much attention to the water-jet apparatus used for compressing the gas, or else the consumption of water and the expense become too great. Moreover, the light has only an intensity of 250 to 450 candles, and therefore it could not compete with the smaller electric arc lamps. Salzenberg has succeeded in obtaining higher powers. His apparatus, however, is complicated; and the high gas pressure of one air employed by him is not at all advantageous, because it affects the durability of the mantles. A difficulty—not, however, insuperable—with high-pressure gas is the necessity for special apparatus for producing the high gas-pressure. This difficulty has induced inventors and gas experts to turn their attention to high-power burners, which require only ordinary pressure.

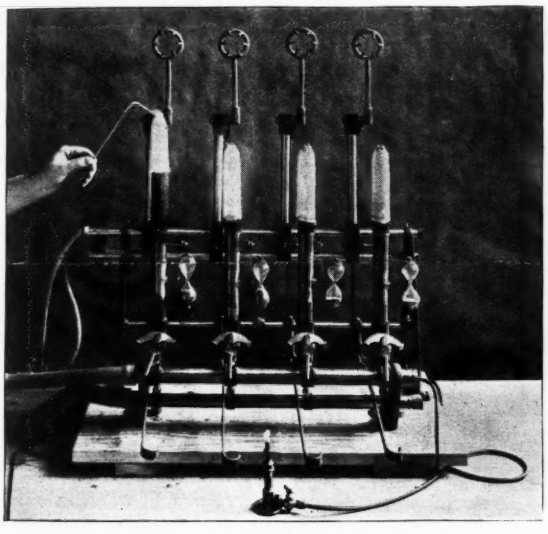
There are a number of such high-power burners; but their intensity is mostly only from 130 to 175 candle power, and as far as they have been examined, they appear to be less economical than the ordinary Welsbach burner. Moreover, their chimneys are very high, and the mantles so long that their durability is diminished. To obtain the highest lighting power, the mantles must not glow up to their top, but only to two-thirds or three-quarters of their length. But such long mantles, not entirely incandescent, have not exactly a beautiful aspect. Of all the high-power burners, the well-known "Lucas" lamp has attained the greatest illuminating power (430 to 525 candle power); and its consumption of gas is economical. The high draught chimney of the "Lucas" lamp interfered with its use for street-lamps; but, owing chiefly to experiments made in the laboratory of the Berlin Municipal Gas-Works, a wind-proof and pleasing form of lantern has been designed, which enables it to be used for street lighting, as in the Friedrichstrasse, Berlin. The degree of illumination attained is little inferior in strength to that of the arc lights in the Leipzigerstrasse, Berlin. But to compete successfully with the electric arc light, a higher illuminating power from incandescent gas-burners was desirable. As this could not be obtained with burners working under ordinary pressure, experiments were undertaken with high-pressure gas. Ultimately, Knapp and Steilberg's apparatus for the "Millenium" light was chosen, as it was simple, worked well, and required little power. By this system, the illuminating power of a single burner of suitable size has been raised to over 1570 candles, which is a power hitherto unattained with the incandescent light.

The high-pressure gas apparatus in question is tolerably well known. It consists of a double-action piston pump for compressing the gas, a receiver for collecting the gas, which is furnished with an automatic arrangement for regulating the supply, and a gas or electric motor for driving the pump. The "Millenium" burners are fairly simple, and are made in various sizes. They have a long, wide, burner pipe, and a head of the same width. The head of the burner is cut off by a number of layers of wire gauze; its whole area serving as an outlet opening for the mixture of gas and air, because the ring-shaped opening common in Welsbach burners has been found not to give so high a lighting power as the full area of the burner top. The mantles are suspended from a lateral holder. Double mantles are used—that is to say, two ordinary mantles are placed one within the other. This is done in the interests both of durability and lighting power. If a single mantle were to become defective in any part, it would, under the strong pressure of the mixture of gas and air, soon fall to pieces and be unusable; while, with a double mantle, it rarely happens that both mantles are defective at the same place. Moreover, numerous experiments have proved that a single mantle, whatever its web, form of mesh, and thickness of fibres may be, will not give such a high lighting power as a double mantle—probably because in the latter case the light emitting surface is greater.

To obtain the highest possible illuminating power, the single threads and meshes of the mantles must have a definite strength

and size. The shape of the mantles must also be regular, in order to give the best effect. The highest illuminating power attained up to the present is 1575 English candles (1800 Hefner units); and the duty is 31 candles per cubic foot with the larger burners, falling to 25 candles per cubic foot with the smaller burners. In Berlin, large burners of 1300-candle power have been used for lighting the Alexanderplatz and the Alexanderstrasse. Two burners are fitted in each lantern, which only differs as to size from the ordinary incandescent lamps. In the lanterns, concave white enamelled sheet-metal reflectors are used, as it has been found that these give a better effect than those made of German silver or silvered glass. At one point in the Alexanderstrasse, where the lamps erected on both sides are at the same or a greater distance apart than the 15 ampere arc lamps used for lighting the Leipzigerstrasse, photometric tests made showed that the average surface illumination of vertical and horizontal surfaces at the same height above the pavement was four times greater than in the Leipzigerstrasse. The maximum of illumination amounted to 49 *lux*. in the Alexanderstrasse and 15·9 *lux*. in the Leipzigerstrasse; the minimum to 7·6 and 1·1 *lux*. respectively. Thus the Alexanderstrasse is not only better, but more uniformly, lighted than the Leipzigerstrasse. As the lamps each contain two burners, and are on both sides of the street, it follows that one of the "Millenium" burners as used there is equal in value to about one 14 to 15 ampere arc lamp.

The lamp-columns on which the "Millenium" lamps in the Alexanderplatz are placed are higher than the ordinary incandescent lamp-columns; and it was difficult therefore to attend to them with the common lamplighter's pole. An electric apparatus constructed by Herr Borchardt was therefore used for lighting. The ignition is at present done separately; but in future, in order to light all the lamps at once, the pneumatic lighting apparatus of Herren Borchardt and Sucker is to be employed. It will work automatically from the high-pressure gas apparatus.



THE BUHLMANN PATENT APPARATUS FOR BURNING-OFF AND HARDENING MANTLES.

Turning, now, to another important improvement in incandescent gas lighting, it is well known that the burning off and shaping of the mantles by means of a high-pressure gas-burner demands a certain manual skill. Even given this, all mantles do not turn out alike; some being wider and others narrower than necessary. The shape of the mantles also is often not at all regular. Herr Buhlmann has invented a process for burning off and hardening which overcomes these evils, and calls for no particular manual skill. The apparatus has a number of upright-tubes, supporting wire gauze frames of the shape of the mantles to be made, but of slightly smaller diameter, and in length equal to about that of the impregnated, but not burnt-off, mantles. A horizontal pipe conveys gas at ordinary pressure to the interior of these wire gauze frames, and air at high pressure is also supplied through another pipe. The mixture of gas and air is lighted outside the gauze, and the supply of gas is regulated so that the whole of the gauze frame is covered with a uniform, thin sheath of blue flame. The mantles are smoothed out as usual, and then each is put on one of the gauze frames, to which gas has not yet been admitted. On turning on the gas and lighting the mixture of gas and air, the mantle burns off—shapes itself at the same time, and takes exactly the form of the gauze frame. In order to give the head of the mantle sufficient hardness and strength, a gas-ring boiling-burner is let down by a lever arrangement immediately after lighting, and its flame plays round the head of the mantle. The lever arrangement also starts a sand glass, which gives the time required for shaping and hardening the mantle—usually 2 minutes. The mantle is then, while the flame is still burning, lifted off by means of a hook, and the flame is then extinguished. The gauze frame is then ready for another mantle. By means of this process, it is possible to obtain mantles of the ordinary or any unusual shape, as it is only necessary to use a gauze frame of the desired form. It may be mentioned that this process has passed the experimental stage, and that at the "Krone" incandescent gas-light factory in Berlin, all mantles are burnt off this way.

SUCCESSFUL APPLICATION OF OXYGEN IN CASES OF GAS POISONING AT ROTTERDAM.

Water gas was first made at the gas-works at Oost-Zeedyk, Rotterdam, on Friday, Nov. 7 last. In order to set the new apparatus working safely, gas consisting almost entirely of nitrogen and carbonic acid, which might therefore be called "flue gas," had been made in the generators the previous day; so that no explosive mixture could be formed by the water gas with the air which otherwise would have been present in the apparatus. On the Friday morning, the "flue gas" had to be driven out; and after the relief gasholder had been partly filled with water gas, this gas was driven by the exhausters to the purifying house, in order to be blown into the outer air through the vessels and a vent pipe. A few things had still to be done to this pipe. Although the workmen employed had been expressly told not to go on the roof until they had permission to do so, and although the danger they would incur had been pointed out to them, two workmen went on to the roof to take some measurements. When the blowing off of the gas was begun at about 11.30 o'clock, the men were just above the mouth of the outlet pipe on the roof, and were rendered unconscious by the escaping gases. Two painters who were below in the purifying house, observed the incident and went on to the roof to give assistance, with the result that they also were rendered unconscious.

Meanwhile, the management had been informed, and blowing off was forthwith stopped, and the outlet pipe shut off. An endeavour was at once made to bring the four men back to consciousness by oxygen inhalation, while waiting for the arrival of a doctor. In the case of the first patient, respiration could not be observed; but when the oxygen was forced into his throat, he suddenly gave a deep sigh. The oxygen evidently was acting at the same time as an irritant. After this patient had been attended for a few minutes, the second was seen to. Although evidently badly attacked, this one so far recovered that in about 10 minutes he opened his eyes and tried to rise. Returning to the first patient, to whom artificial respiration had been applied during the last 10 minutes, it appeared that he had relapsed, as respiration had sensibly diminished. On repeating the application of oxygen, the breathing and the beating of the pulse became stronger again. About 1.30 o'clock the four patients were moved from the roof; three could then walk, and the fourth was laid on a couch. This fourth patient had not taken oxygen; he remained unconscious for some time after the others could walk about. He also was distinguished from the others in that he uttered cries, and at times strongly resisted the attempts made to bring him back to consciousness. After consciousness had been restored, he also remained longest under the influence of the gas poisoning.

"Het Gas," which reports the accident, considers it rash to draw any positive conclusions from what has been said, because the physiological qualities of the individual play an important part. Appearances, however, all tend to show that the oxygen inhalation was of great value. It adds that Dr. Michaelis, of Berlin, has quoted a case in which a workman had been given up as hopeless by the doctor at midday; but after treatment with oxygen, he was on duty again as usual the same evening.

INCREASE OF PURIFYING CAPACITY BY THE USE OF "JÄGER" GRIDS.

The following particulars, taken from a recent number of "Het Gas," illustrate the gain in purifying capacity which may be secured by the adoption of the "Jäger" system of purifier grids, to which reference has been made from time to time in the "JOURNAL." "Jäger" grids have already been employed with much success at the gas-works at Wiener-Neustadt, Kremsier, and Lemberg; and they are now being tried at the Municipal Gas-Works in the Gitschiner Strasse, Berlin. The following figures will be useful in comparing purifying by the new with that by the old system of grids: Size of purifiers, 5·8 by 6·3 metres = 36·54 square metres (393 square feet) area, with a depth of 1·6 metres (5 ft. 3 in.). Inlets and outlets 600 mm. (23½ inches) in diameter.

—	Gas Purified in 24 Hours.	Loss in Pressure.
With the old system of horizontal grids.	1,271,400 cubic feet	5·9 inches
With "Jäger" grids	2,542,800 ,, ,,	3·5 ,,

At the Berlin works, bog iron ore, mixed with sawdust, is the purifying material used. It was usual, when the first vessel had been filled with new material, to empty it after 24 hours, and then fill it with material which had already been used once, as the new material was found after twenty-four hours to have become

ineffective. On employing the new grids, with new bog iron ore, the first vessel was opened after three days had elapsed, and the works' officials were astonished to find that the material was only half foul, and that the vessel could still have been kept in action for three days more. At the meeting of Dutch Gas Engineers at Hilversum last year, Heer van der Horst expressed the opinion that the "Jäger" grids could only be used for small vessels. The experiment at Berlin indicates, however, that they give good results also with tolerably large purifiers.

THE DETERMINATION OF PRUSSIAN BLUE IN SPENT OXIDE.

The following is an abstract of an article on this subject, by Herren Bernheimer and Schiff, which appeared in a recent number of the "Chemiker Zeitung."

The authors first of all proved that on employing pure prussiate of potash (potassium ferrocyanide), the amount of iron in the blue produced from it agreed with the quantity of iron in the potassium ferrocyanide. The proportion of blue in various samples of oxide which had been used in the purifiers was determined (1) according to Dr. Knublauch's well-known method, and (2) by the ignition of the separated prussian blue. The alkaline solution, produced according to Knublauch's method, of the separated prussian blue, was made up to a certain volume, and aliquot portions were taken for both determinations. The results obtained were—

Sample No.	I.	II.	III.	IV.	V.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
According to Knublauch's method . .	11·74	11·49	5·03	12·39	12·94
By gravimetric determination	12·45	13·72	6·99	14·06	13·87

The weighed ferric oxide proved to be chemically pure. After the third precipitation, the result of the quantitative determination remained constant. Both in pure potassium ferrocyanide and in the prussian blue produced from it, the same quantities of nitrogen were found according to Kjeldahl's method. Thus :

	Found. Per cent.	Calculated. Per cent.
(1) Nitrogen in the potassium ferrocyanide. .	20·10 ..	19·90
(2) Nitrogen in the precipitated blue . . .	20·01 ..	19·90

The determination of the nitrogen in the prussian blue which had been precipitated a second time from the spent oxide, resulted as follows: Sample No. II., 13·76 per cent.; No. III., 6·73 per cent.; No. IV., 13·96 per cent.

Evidently there is concordance; but owing to the high molecular weight of prussian blue, slight differences in the nitrogen determination cannot lead to a conclusion as to the purity of the oxide. The authors express the view that spent oxide contains other combinations besides, either containing iron or free from iron, which are precipitated along with the iron salts. In this way an explanation is afforded of the high results obtained by gravimetric analysis. The absence of compounds containing iron was proved, in the samples in question, by determining the iron in one portion of the alkaline solution used for titration, after decomposition with sulphuric acid. The results were: According to Knublauch's method, 12·39 per cent.; from the iron in the alkaline solution, 12·20 per cent.; but by weighing the ferric oxide, the result was 14·06 per cent. There is the further possibility that compounds free from iron, which can be precipitated along with iron salts, are responsible for the higher values found by the gravimetric analysis. A prussian blue produced by double precipitation was decomposed with a solution of caustic potash, according to this equation, and the iron in the solution, as well as the precipitated iron, was determined:—

$$Fe_7(CN_{18}) + 12\ KOH = 3\ K_4Fe(CN)_6 + 2\ Fe_2(OH)_6.$$

From the iron in the filtrate was calculated $K_4Fe(CN)_6 + 3\ H_2O$ = 12·14 per cent.

From the iron as $Fe(OH)_3$ was calculated $K_4Fe(CN)_6 + 3\ H_2O$ = 15·64 per cent.

In any case with Knublauch's method, after accurate testing of the filtrate from the copper precipitation with iron chloride, compounds which are capable of precipitation appear to escape this test. Thus there was found: According to Knublauch's method, 11·27 per cent.; and by gravimetric analysis, 11·85 per cent.

The precipitate obtained after the Knublauch titration was filtered off, and the filtrate free from copper, after addition of ferric chloride and hydrochloric acid, was slightly concentrated on the water bath. The blue deposit which settled out thus, after decomposition with alkali, again yielded potassium ferrocyanide. The percentage of iron in the deposit was determined by gravimetric analysis, and showed uncalculated blue amounting to 0·7 per cent. Added to the above-found 11·27 per cent., this gave 11·97 per cent., which therefore nearly agreed with the result of the gravimetric determination. The Knublauch method therefore appears to Herren Bernheimer and Schiff to be wanting in completeness at this degree of dilution.

GAS-ENGINE RESEARCH IN GERMANY.

One of the recently issued volumes of "Proceedings" of the Institution of Civil Engineers contains the following abstract of a paper by Herr E. Meyer in the "Zeitschrift des Vereines deutscher Ingenieure."

This is the first instalment of the results of experiments of gas-engines carried out at the Institute for Technical Physics at the George Augustus University in Göttingen. The engine employed for the research work is a 10-horse power Deutz motor. Both lighting and power gas are to be used. A description is given of the engine, power-gas plant, and the apparatus to be used for measuring the gas, cooling the water, &c., and the degree of accuracy to be expected with the measurements.

The first questions investigated related to the effects of varying amounts of piston lubrication and the temperatures of the cylinder walls. The lubrication was begun with one drop every 40 seconds, for which the mechanical efficiency was 0·706, and the quantity of gas used per brake horse power per hour 29 cubic feet, and per indicated horse power per hour 20·5 cubic feet. The lubrication was gradually increased until the oil was running in almost a continuous stream. The mechanical efficiency had risen to 0·79, the gas used per brake horse power per hour had fallen to 23·2 cubic feet, and per indicated horse power per hour to 18·3 cubic feet. The load on the engine was practically the same throughout.

The great decrease in the quantity of gas used as the supply of lubricant was increased is accounted for by Herr Meyer on the supposition that some of the oil was vaporized in the cylinder, and burned along with the gas. More elaborate experiments were made with the same result. In further trials, the temperature of the cylinder walls was varied from 16° to 70° C., while the oil supply was very liberal. In both cases the heat value of the gas supplied was 9648 B.T.U. per indicated horse power per hour. From this it seems possible that, even at comparatively low temperatures, lubricating oil may be burned and contribute to the work done on the piston. The accuracy obtainable with the ordinary indicators was specially investigated, and also the methods of calibrating the springs. The temperature of an indicator may, of course, vary; and it was found in one case that the scale of the spring altered by 4 per cent. when the temperature was changed from that of an ordinary room to about 90° C. The dynamical theory of the indicator is applied to a few actual cases, and a graphic method is given by which the use of a Fourier series to represent the relation between pressure and time is avoided. The inertia of the parts is found to have little effect. Friction and inaccuracy of fitting in the indicator motion are the most important factors in distorting diagrams from their true shape. The indicated power of a gas-engine cannot be determined with perfect exactness; and while in many cases an accuracy of 1 per cent. may be obtained, in others the errors may be as much as 2 or 3 per cent.

VILLAGE LIGHTING BY ACETYLENE.

According to the "Acetylene Journal" (New York), the selling price of acetylene by town lighting plants varies from a minimum of $1 to $1·75 per 100 cubic feet. Even at $1·50 per 100 cubic feet, acetylene is selling at a less price than ordinary city gas in towns of 5000 to 15,000 people, based upon actual light developed. A town in which 150 consumers can be secured upon three miles of street-mains would require for street lighting about 35 lamps, and would probably use (all told) an average of 1600 cubic feet of acetylene per day. The operating results of such a plant would be about as follows:—

Consumption, average 1600 cubic feet per day, or 48,000 cubic feet per month.

Expenditure.	Per Month.
Carbide at $70 per ton f.o.b. gas plant	$336·00
Labour, cartage, water, statement-taking, stationery, lighting, and extinguishing street lamps, supplies, &c.	150·00
Leakage, depreciation, taxes	25·00
Total cost of operating	$511·00
Receipts.	Per Month.
From consumers at $15 per 1000 cubic feet (equivalent to city gas at $1·50 per 1000)	$688·50
From city for street lighting at $18 per year per lamp	52·50
Total receipts.	$741·00
Net profit per year	$2760·00
Net profit per month	$230·00

Equivalent to 26½ per cent. on an investment of $10,400.

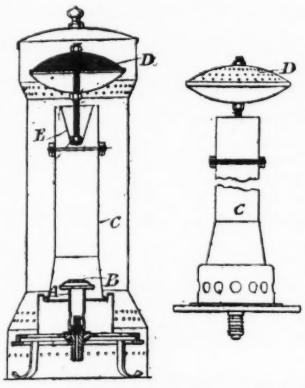
For an installation expected to supply about 10,000 one-foot acetylene lights, the main pipe in the street might be 4 inches in diameter, although this would depend upon the length of the run. If the town is very compact, and not over 1000 feet of the largest size main would be required—a 3-inch pipe would be sufficient. From the main 3-inch or 4-inch pipe, the lateral branches would reduce to 2-inch, 1½-inch, and possibly as small as 1 inch.

REGISTER OF PATENTS.

Burners for Heating-Stoves.—Ross, M. L., of Paris. No. 778; Jan. 10, 1902.

In burners and heating stoves to which this invention relates (says the patentee), it has hitherto been the practice to provide a layer of gauze, of relatively large area, upon the top of the mixing-tube upon which the flame burns; an expansion chamber being formed in the mixing-tube immediately beneath, by means of layers of gauze or perforated diaphragms through which the mixture of gas and air passes from the main part of the mixing-tube. Such burners and heating-stoves have the disadvantage that the flame is apt to fire-back in lighting and in draughts of air; while, moreover, the topmost layer of gauze soon corrodes, whereby the flame fires-back on the lower layers of gauze, and incomplete combustion results.

The burner suggested is provided at the top with a mixing-chamber insulated from the main body or lower part, and having an inwardly protruding cone. A double bunsen burner or double air supply is provided, for ensuring a relatively large proportion of air to gas, and for effecting intimate admixture. A hollow radiator is mounted upon the burner which is heated by the flame, and thus accumulates and radiates the heat.

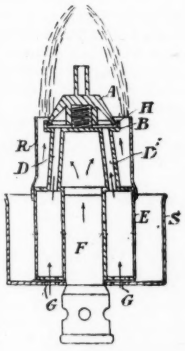


The construction of the stove will be seen by the illustration. The gas is admixed in the nozzle A, with air passing through the holes at the side. The mixture which is relatively rich flows out through the perforated cap B, and passes outwardly—inducing a further and second supply of air coming through the holes shown in the supporting part of the mixing-chamber casing. The mixture formed in the chamber C has a relatively large proportion of air, which is intimately admixed with the gas; and the mixture expanding in the top part of the mixing-chamber, gradually heats the radiator D to incandescence.

Numerous experiments, it is said, determine that the best results are obtained by arranging the apex of the upper cone E a little short of the full length of the top of the chamber C. In a stove of the capacity of 5 cubic feet of gas per hour, a good result is obtained from the employment of the cone of a depth of $1\frac{3}{8}$ inches; the total length of the mixing-tube being $11\frac{1}{4}$ inches, with a diameter of $2\frac{1}{2}$ inches. In larger sizes of stove, where from 10 to 20 cubic feet of gas per hour are consumed, the length of the mixing-tube may be maintained approximately the same or even less, with the depth of cone slightly increasing in the same proportion as the diameter of the mixing-chamber necessitated by the greater utilization of gas.

Incandescent Gas-Burners.—Sieverts, W. H. A., of Hamburg-Uhlenhorst. No. 2056; Jan. 25, 1902.

This invention relates to incandescent gas-burners in which the air for combustion is preliminarily heated in the burner-head or in a hollow space arranged above it, and such air is then conducted through an annular slit into the internal portion of the flame.



Over the mixing-tube of the bunsen burner is placed a hollow cylindrical body provided below with apertures G, and above with small tubes D, surrounded by a tube R seated on the top of the main chamber and forming the burner-head. A disc or tray B, into which the upper end of the tubes D open, limits the burner-head at the upper end. Upon a screw-threaded stud of the tray is adjustably secured a burner-cone A. The upper edge of the burner-head is flush with the upper edge of the tray B, and the burner-head R may be made adjustable with reference to the height of the tray.

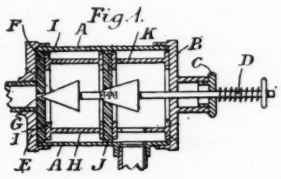
The burner acts in the following manner: The mixture of gas and air, issuing from the bunsen tube F, enters the space enclosed by the tray B and the surrounding tube R, and passes out through the annular slit formed between the edge of the tray and the upper end of the tube, at the exterior of which it is ignited. As soon as a chimney is placed in the gallery S, atmospheric air is induced through the lower openings G into the main chamber, where it becomes heated. Thence it flows, through the tubes D, into the chamber formed by the hollow burner-cone A and the tray B, and finally escapes into the flame. As the space from which the flame issues through the narrow annular slit is in immediate contact with the flame, and the air is obliged to remain in this space for a comparatively long period (the space is very large proportionately to the slit), it is evident that the air impinging against the flame is exceedingly hot.

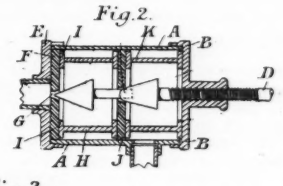
Valve for Coin-Freed Meters.—Husband, J., of Chiswick. No. 9071; April 18, 1902.

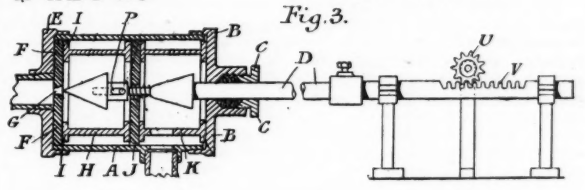
The object of this invention is to construct a double-check valve for use in connection with the coin-freed mechanism of gas and other meters, in such a manner that, should one valve not completely shut off the supply, the other will do so.

Fig. 1 is a sectional elevation of the appliance when constructed for a push motion to close and open the valves. Fig. 2 is a similar view for a screw motion, to open and close the valves. Fig. 3 shows the two valves kept at their proper distance apart by a spring; also one method of operating the valve-rod.

At one end of the tubular casing A, is a screw cap B, which carries a packed gland C, through which the valve-rod D passes; the other end of the casing being closed except to a hole, or it can also be provided with a holed cap E. Into the end of the casing, a leather or other valve seating F is placed, having a hole G in its centre of smaller diameter than the hole in the cap E. On this seating is a liner or short tube H, having flanged edges I; and on this tube is placed another leather or other valve-seating J—the hole being of smaller







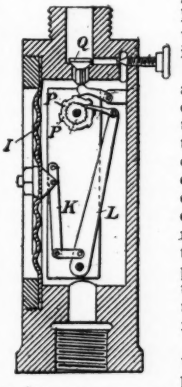
diameter than the inside of the liner flanges I. On this second valve seating is placed another flanged skeleton or holed liner K, with its top projecting above the top of the casing. When the top B is applied and screwed home, it will act upon the top flanged liner K, and press it, the other liner H, and the valve-seatings F J, towards the end E of the box, and thus ensure tight joints—the box being divided into two compartments, one valve being in each as shown.

The valves-spindle D is actuated by the coin-freed mechanism of the meter or other mechanism, and can be either pushed up or down, as at fig. 3, by a pinion U acting on a rack V formed in the shaft D, or it can be worked by a worm or thread to effect a rotary motion; and by using a double valve, the advantage of a second seating is obtained for sealing the passage. That is to say, if the one valve fails by some reason to close, the mechanism still operating pushes or screws the spindle down until the other valve seals the inlet.

According to figs. 1 and 2, the valves are adjusted to a fixed position with regard to each other, and the right-hand one closes first; but according to fig 3, the valves are in an adjustable position as regard each other, and the left-hand one closes first. However, should anything occur that this valve does not shut off the gas, then the mechanism still operating will cause the other valve to continue its movement to close the orifice—the stem of the rod D passing in the hollow plug P in its movement.

Valve Appliances for Regulating the Supply of Gas to Jets which are Ignited and Extinguished by Shocks or Variations of Pressure Produced in the Gas Supply-Pipe.—Shillito, T. R.; a communication from G. Goliasch and Co., of Berlin. No. 4675; Feb. 24, 1902.

The valve appliance of this invention is interposed in the gas supply-pipe leading to the burners, for the regulation of the supply of gas to small flames which are lighted up, or the extra lighting-up flame extinguished by shocks or vibrations produced in the gas supply at short intervals.



At one open side of the casing shown, is fitted a flexible membrane I, which is caused to oscillate or bend when shocks or variations of pressure take place in the gas. The membrane is attached to a lever K, one end of which is adapted to turn on a fixed point in the casing, while the other is connected with a lever L turning at its lower end on another fixed point in the casing. At its upper end, it carries a pawl for engagement with a rachet-wheel, and through this a cam wheel or toothed wheel P, which is engaged by a small pawl-like lever. There is a set-screw for controlling an orifice through which a small quantity of gas flows to the burner for the purpose of maintaining an igniting flame.

Upon each increase of pressure taking place in the gas supply, or shock caused by an increase of pressure, the membrane is bulged outwards, and the wheel P moved round a certain distance to lift with one of its teeth the free end of the lever, and with this the valve Q past which the gas flows to the burner. To close the valve Q, the wheel P must be moved, in the same way, further round until the lever above it sinks down into one of the recesses between the teeth—thus extinguishing the gas-jet or flame fed by the gas flowing past the valve.

By varying the divisions of the teeth of the wheel P, appertaining to a corresponding number of burners, some of the valves Q, leading each to a small flame, may be opened, while others remain closed; so that, if desired, certain gas-flames, or a whole series, may be ignited or extinguished. Further, the lever L and pawl may be located on the

opposite side so as to turn the rachet-wheel from the position shown, whereby a reduction of pressure in the gas supply, instead of an increase of pressure, may serve the purpose of lifting and closing the valve Q at short intervals—to produce flash lights for instance.

Manufacture of Coal Tar Compositions and Pitches.—Lake, H. H.; a communication from F. J. W. Warren, of Newton, Mass., U.S.A. No. 9322; April 22, 1902.

The invention relates to an improvement in coal tar and its products—such as paving composition, pitches, and the like—for use in roofing, paving, water-proofing, insulating, or for other like purposes. It is "based on the discovery that a tar or pitch that consists of nearly pure bitumen is more subject to changes of temperature than one which is relatively an impure bitumen—that is, it will flow easier when warm, and will become more brittle when cold, than a tar or pitch which is not so pure."

The impurities ordinarily existing in bitumens consist (says the patentee) of very finely divided amorphous carbon, similar to the lamp-black of commerce. But the percentage of lamp-black existing in the different crude tars varies from 7 per cent. in the purest tars to as high as 35 per cent. in other tars; and when these tars are made into a roofing pitch, the pitch resulting therefrom will contain from 8 to 48 per cent. of lamp-black.

The patentee claims to have discovered that a tar which contains more than 20 to 25 per cent. of lamp-black, when used for making roofing felt, will not saturate the dry felt well, and will leave a sticky surface. But by mixing with this tar one which will reduce the impurities below the limit given, the tar will saturate the paper thoroughly, leaving a comparatively non-adhesive surface, and make the felt weigh more than if the saturation was not thorough. He also finds that if roofing pitch be made containing 35 to 40 per cent. of lamp-black, its adaptability and life is greatly increased. Paving composition may contain as high as 50 per cent. of these impurities, and greatly increase the value of the composition from which it was made. An insulating composition may contain from 40 to 60 per cent. of lamp-black.

The invention contemplates the addition of this finely divided inert matter to tars or compositions, either during the manufacture of the crude tar, to the crude tar itself, or to the products of the tar during or after their manufacture. The amount of lamp-black which may form during the production of the tar can be regulated by varying the shape of the retort, or by altering the methods of making the gas, or the heat at which the retorts are held during its manufacture, without materially affecting the other products of distillation. It may be introduced into the crude tar in bulk and effecting a mixture by means of agitation, or it may be introduced by carbonizing oil and forcing the lamp-black laden air resulting therefrom into a mass of tar or composition, the lamp-black mixing with the tar during its passage through it. The presence of this fine inert matter is also expecially valuable when the tar or composition is to be used for paving purposes.

Incandescent Gas-Burners.—Danvin, R., of Courbevoie, France. No. 24,001; Nov. 3, 1902.

The tube of this burner for incandescent lighting is formed as a double cone. In the upper part is loosely arranged a core, with rounded under-face, having metal strips arranged in a star-like form on its surface. These metal strips form small channels in the upper part of the burner-tube, which serves for the outflow of the gas to the place of combustion.

Above the gas outflow F is arranged the burner-tube in the form of two superposed truncated cones—the narrow parts together. The burner-tube is provided with the usual lateral openings E for the admission of air. The upper part of the tube either terminates in a cylindrical part B or is conically prolongated. Into this upper part is inserted a core C, having a semi-circular under-surface G and metal strips D arranged over its whole side surfaces—the strips fitting exactly in the part B. These metal strips provide small channels between the core and the outer tube, so that the stream of gas is rapidly ejected, and is finely distributed and directed in small streams to the place of combustion.

Manufacture of Sulphocyanide of Calcium.—Carpenter, C. C., of the South Metropolitan Gas Company, Old Kent Road. No. 22,710; Oct. 18, 1902.

This invention relates to the treatment of coal gas, or gases containing cyanogen compounds, in order to obtain therefrom all the cyanogen in the form of a sulphocyanide. The crude gas—preferably cooled and deprived of tar—is treated with a mixture of slacked lime and sulphur, which may be either suspended in water and allowed to run (continuously or intermittently) into a washer or scrubber of suitable form, or the mixture may be used in a moist condition, placed in the ordinary gas-purifiers. In either case, all the cyanogen present in the gases under treatment combines to form sulphocyanide of calcium, which may be extracted or utilized by any convenient method.

If it is desirable to proceed by the wet process, the gases containing the cyanogen compounds are passed through an upright tower or scrubber of the usual form, or through a horizontal rotary washer divided into compartments. In either case, a stream of milk-of-lime, to which sulphur has been added, is caused to flow through the apparatus, in the contrary direction to the gas. The milk-of-lime mixture is made by adding lime to water, in the usual manner, and while the fluid is being agitated, adding thereto flowers of sulphur in a state of fine powder. The lime and the sulphur are held in suspension by keeping the mixture agitated in the usual way; and the mixture is then allowed to flow into the extracting apparatus at the required rate. The cyanogen compounds are rapidly absorbed, and the strong solution containing them is run off at the other end of the washer. From this solution, the sulphocyanide can be separated or utilized in any desired manner.

To proceed in the dry way, the lime is only slacked with sufficient water to render the mass moist; the sulphur added thereto; and the mass thoroughly mixed. The material so prepared is then placed either in a separate purifier, used before those ordinarily required for the purification of gas, or one or more trays of the ordinary purifiers can be set apart for this purpose. The quantity of sulphur required to recover as sulphocyanide the cyanogen present in the gas to be treated is in accordance with the equation $R_2CN + S_2 = R(CNS)_2$. The lime is in considerable excess.

Spent purifying material (if lime is used) produced in gas-works, and which contains considerable quantities of free lime, may be substituted for the ordinary lime if desired.

APPLICATIONS FOR LETTERS PATENT.

1276.—Clark, W. R., "Heat regulator for gas." Jan. 19.
1288.—Melhuish, A. G., "Internal combustion engines." Jan. 19.
1314.—Stumpf, J., "Steam or gas turbines." Jan. 19.
1342.—Cresswell, J. J., "Street-lamp chimneys and the like." Jan. 20.
1424.—Bousfield, J. E., "Supports for incandescent mantles." A communication from S. Falk. Jan. 20.
1425.—Bousfield, J. E., "Regulating incandescent gas-burners." A communication from S. Falk. Jan. 20.
1442.—Pickering, W. S., and Grove, H., "Valves for gas-purifiers." Jan. 20.
1487.—Hubert, A. E., and Edwards, W., "Automatic tester for locating leakages in pipes." Jan. 21.
1541.—Thorp, T., "Meter indexes." Jan. 22.
1543.—Helps, G., "Gas burners and mantles." Jan. 22.
1560.—Graham, M., "Hot-coke conveyors." Jan. 22.
1578.—Doulton, H. L., and Pleace, R. J., "Controlling the flow of liquids and gases." Jan. 22.
1602.—Elworthy, H. S., and Williamson, S., "Manufacture of gas." Jan 22.
1618.—Lanchester, F. W., "Gas and oil engines." Jan. 23.
1619.—Lanchester, F. W., "Internal combustion engines." Jan. 23.
1630.—Terry, G., "Device for carrying the mantles of incandescent gas-lights." Jan. 23.
1659.—Johnston, A. A., "Production of gas from coal tar." Jan. 23.
1696.—Melhuish, A. G., "Internal combustion engines." Jan. 23.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Inclined v. Horizontal Retorts.

Sir,—Replying to Mr. West's letter in this week's "Journal," permit me to point out that, in order to enable him to improve the Bury figures, he claims a lot of disadvantages which he says exist there, and that I am not asking for any correction under this head, but simply taking things as they are. I should also like to again emphasize the point that working horizontals, even with machinery, is more laborious work than with slopers; and I have yet to learn that, on the former system, the men can do twelve hours' work and go away at the end of nine hours. I say distinctly it is not practicable, and is not being done, and that therefore horizontals cannot, as Mr. West claims, do work under exactly the same conditions as inclines.

In my first letter to Mr. West, I gave costs extending over five months, embracing both minimum and maximum productions. Mr. West replied that Bury was working cheaper; and he proceeded to show this by picking out a few maximum weeks only. I think this was anything but a fair thing to do. Now that I have pointed this out, Mr. West, in his reply, ignores the point altogether. I do not claim to be working my installation cheaper than any of my colleagues are doing with slopers, and am more than anxious to learn anything I possibly can from brother managers who are also trying them. With regard to Blackpool, I am very pleased indeed to hear they are doing so well, although no details are furnished. If Mr. West had not claimed that at 1s. 1½d. per ton of coal carbonized Bury was working as cheap as, if not cheaper than, anywhere else, not even excepting Blackpool or small works, I should not have criticized his statement.

Now that I have established the fact that Bury's 1s. 1½d. should be 1s. 3½d., and would be much higher for a small works like mine, I am content to let the matter drop so far as this subject is concerned. But while I have pen in hand, perhaps you will allow me to draw attention to other important things. In my opinion, we in the gas industry who represent gas companies stand at the parting of the ways, and are altogether on a different plane to those managers who represent municipal undertakings. Many of us have invested our little all, or nearly so, in our own and other similar concerns; and we cannot afford to stand still and see our investments go backwards way. We have two great facts before us—one, that electricity is now being supplied at 1½d. and 1d. per unit, and another that the Gas Institute has been captured by a body which I really think, with all due respect to them, would soon have become moribund, and that in consequence so called "Traders," who invent 90 per cent. of the improvements in the gas industry, are practically expelled. I ask, Is it not high time that a National Institution was formed embracing gas engineers and managers, inventors or traders, higher officials, and intelligent workers? I shal

be glad to receive communications from those who are willing to form an Association on a broad basis, with the object of calling a meeting at an early date.

A. F. GOODSON.

Heckmondwike, Jan. 31, 1903.

SIR ,—With regard to the last paragraph in Mr. West's letter in this week's issue, I can assure him I was in all seriousness when I stated that electricity might be brought to play an important part in the economy of the retort-house; and I doubt not but we may yet see Mr. West's own machines fitted with, and worked by, electric motors.

ALEXANDER ALLAN.

Scarborough, Jan. 29, 1903.

Clip for Meter Connections.

SIR,—Noticing in your issue for the 20th of January a communication from Mr. Green, of Preston, in which he states that he has in use a clip similar to the one now being sold as a "pipe union seal attachment," of which I am the sole inventor and patentee, I should be obliged if you would grant me the same privilege of the use of your columns to say, in reply thereto, that the Preston clip (which neither I nor probably anyone else out of Preston ever heard of, much less saw, until mine was patented) is not similar to mine, as any impartial examiner of both, with Mr. Green's letter and my specification before him, can see, either in cost, convenience, mode of attachment, or object for which it was introduced and is used in that town. My clip was invented chiefly to prevent, while gas is being supplied, the illegal disconnection from the service-pipe of the main-tap and meter inter-unions; whereas the Preston clip was introduced and is used there when gas is not being supplied, though why it is used at all—with the gas turned out of the service-pipe, as it ought to be, and with an up-to-date company is—neither I nor any other person whom I have met can explain.

My clip cannot be successfully tampered with, even by an expert, either in its hinge-pin, sealing-cup, or other parts; and it requires no additional paraphernalia for fixing it, and for the company's official to carry, except a drop of wax or other suitable sealing substance, and the pressing thereinto of the company's seal—numbered for the official's identification; while the Preston clip, with its cork and holed lugs, for a lock—not a seal—is of no practical or commercial use for any purpose, and for mine especially, even if it were permissible to so apply it, as any travelling tinker could take it off and put it on without detection; and commercially because its cost, with locks, puts its adoption out of the question.

My main idea was to lock the stable with the horse inside; Preston's appears to be to do so when the horse has gone.

W. G. BRIDDEN.

Liverpool, Jan. 28, 1903.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Friday, Jan. 30.

(*Before Mr. Justice* FARWELL.)

Foster and Dicksee v. Mayor, &c., of Hastings.

This was a motion for an injunction to restrain defendants from entering upon, or taking possession of, any of the works in course of erection under a contract in connection with the water-works in the Brede Valley.

Mr. UPJOHN, K.C., and Mr. DICKINSON appeared for the plaintiffs; Mr. BUTCHER, K.C., and Mr. M'SWINNEY represented defendants.

Mr. UPJOHN said that in December, 1898, plaintiffs entered into a contract for sinking three wells in connection with the water-works belonging to the Corporation of Hastings; the intention being to connect the three wells by a heading, so that the water obtained in well No. 2 would gravitate to Nos. 1 and 3, where the pumping plant was. The last-named wells were completed; but the sides of No. 2 caved in, and the physical conditions were such that the well had to be abandoned. Then the Engineer found it necessary to get a different site; and he asked the Contractors to enter into a supplemental agreement involving further payments—the provisions of the 1898 contract being applicable to the new contract. The Corporation were their own contractors as to the heading towards well No. 2. In October last, well No. 2 was flooded by an inrush of water; and the plaintiffs had, by the orders of the defendants, been pumping it to the Corporation water-works for the use of the town. Towards the end of December, plaintiffs suggested that they would like to meet the Water Committee, as they thought they did not quite understand what ought to be done to get rid of the water; and on the 10th of the month a meeting took place. A suggestion was then made by one of the members of the Committee that, to avoid possible conflict of liability and for other reasons, it would be desirable that the work of driving the heading and completing the well should be in one and the same hands. Clause 10 of the contract provided that if, in the judgment of the Engineer, the work was improperly conducted, or sufficient despatch was not used, the Council or the Engineer could, by giving six days' notice in writing, dismiss the Contractors and appoint someone in their place. On the 6th of January such a notice was given, though no previous complaint had been made of delay. Accompanying this notice was a letter, marked "Private," from the Engineer, stating that the Council had come to the conclusion that it would be better that the whole of the underground work should be in the hands of the Engineer, and that it should be carried out by the Corporation's own staff; and he was therefore instructed to send the notice, though it was not done from any ill-feeling, but really to expedite the work. Thus it was perfectly plain that the Engineer did not give the notice under clause 10, but from an indirect motive. A letter from the Town Clerk was also sent on the same date, stating that the Council thought the work had been unduly delayed, and that they had instructed the Engineer to exercise the power vested in him under clause 10. It was plain, however, that the Engineer had not exercised any independent judgment, and that the notice was served to enable the Corporation to get the work into their own hands so as to complete it on cheaper terms than the Contractors had offered. A further affidavit had just been made by the Engineer, in which he stated that he had exercised an independent judgment; but this did not displace the *prima facie* case made by plaintiffs.

Justice FARWELL said he did not think it had ever been decided that an engineer was bound to hear what a contractor had to say before he discharged him.

Mr. UPJOHN submitted that an engineer was bound to act fairly between the parties, and that the *status quo* should be preserved until after the matters had been referred to arbitration.

Mr. BUTCHER contended there was nothing to arbitrate about.

Justice FARWELL said he could not decide on a motion whether or not the Contractors had been guilty of undue delay. As the facts were in dispute, he should prefer to see the witnesses.

Mr. UPJOHN suggested that the better plan would be to get on as quickly as possible with the arbitration, so as to avoid going into engineering details at the trial.

Justice FARWELL said he would hear Mr. Butcher as to whether things should not remain as they were until after the arbitration.

Mr. BUTCHER at some length contended that the Engineer was sole arbitrator as to whether or not the works had been carried out with sufficient despatch; and he not having acted *mala fide*, the Corporation were entitled to take possession of the works.

Justice FARWELL said he failed to see a single complaint by the Engineer of delay.

Mr. BUTCHER said there had been many verbal complaints. Before it was said that one could have an arbitration, there must be a dispute; and here there was none, as the Engineer had already decided. If the power of re-entry was wrongly exercised, the Contractor might be entitled to damages; but he could not obtain an injunction.

Justice FARWELL said, without prejudging the case in any way, he thought it very desirable that the *status quo* should be preserved until the trial of the action, which would come after the award of the Arbitrator; and he therefore granted an injunction as asked until that gentleman had made his award upon the questions submitted to him.

BOW COUNTY COURT—Friday, Jan. 30.

(*Before His Honour Judge* SMYLY *and a Jury.*)

Clark v. Gaslight and Coke Company—Claim for Compensation for Summary Dismissal.

This was an action brought to recover £5 8s., alleged to be due to the plaintiff for four weeks' wages, under an agreement, in lieu of notice.

Mr. W. M. THOMPSON appeared for the plaintiff; Mr. A. NEILSON (instructed by Messrs. Bedford, Monier-Williams, and Robinson) represented the defendants.

Mr. THOMPSON, in opening the case, said that though a very short point was involved, it was one which affected a large class of workmen. Plaintiff was engaged by the defendants, under an agreement dated Dec. 1, 1894, as a fitter, upon terms which provided for one month's notice on either side, but with power to the defendants to summarily dismiss the plaintiff for gross misconduct. Clark subsequently met with an accident while in the service of the Company, whereby he lost four fingers, and, under the Workmen's Compensation Act, he was awarded £1 a week, being half his average weekly wages. Subsequently the Judge varied the order by making it 14s. 9d. per week, on the understanding that the man should be taken back by the Company to do such lighter work as he was capable of performing. The plaintiff was therefore employed as gatekeeper, and was paid 27s. weekly in addition to the compensation money of 14s. 9d. per week. On the 23rd of October last, he was sent for by Mr. Reeson, one of his supervisors, and was told that in future part of his work would be to take down, at the gate at which he was stationed, the names of the foremen and workmen who might come in late—*i.e.*, after 7.30 in the morning. The plaintiff asked Mr. Reeson if he might tell the men he had been instructed to do this—the names of the men who were late not having been taken before—because, unless he told them that some higher official had ordered him to do so, they might resent his interference, and probably assault him. Mr. Reeson said the plaintiff was not to say who authorized him to do so, but must take the names of those coming in late. The plaintiff asked that a printed notice should be put up on the works to this effect; but he was told that this could not be done. He thereupon refused to take the names, and was dismissed from his employment.

Plaintiff was called, and, in answer to Mr. THOMPSON, repeated the facts as set forth above, in regard to his engagement as gatekeeper. Coming to the order given by Mr. Reeson, the Second Engineer, on the 23rd of October, he said he failed to understand it, and asked what it was for. Mr. Reeson told him it was to get the time of the foremen and workmen who came in after half-past seven in the morning. The next day, after he had considered his position, he told Mr. Reeson that he thought it was a great wrong that he should be asked to do such a thing. The following morning Mr. Reeson asked him for a report; and he told him he had none to make. He had not taken down the names of any of the men who had come in late. Though there were 18 who had gone into the works between half-past seven and eight o'clock, he only knew two of them by name, and did not inquire of the others what theirs were. Mr. Reeson asked him for the names,

and he gave those of Mr. Henn and Mr. Dodds, the foreman; but as a matter of fact, he did not know the names of the other workmen. He did not know the name of one man in fifty who went through the gate. He asked Mr. Reeson if he would put up a notice that the names would be taken down, in which case he would be prepared to obey the order. Otherwise he did not consider he had any right to do so, because he had always understood that a man must know what the law was before he broke it, as after breaking it ignorance was no plea. He had four reasons for doing this: (1) It was the highway down to a fully licensed public-house; (2) it was the highway to the railway station; (3) it was a highway down to the shipping and the jetty; and (4) it was a road for pedestrians to walk across to the docks. He told Mr. Reeson that, as strangers were entitled to pass, he had no right to challenge them. For four weeks he kept his position, when Mr. Iago, the Chief Engineer, spoke to him as to not taking down the names; and he replied that he did not like the thing being done secretly. A book was given to him in which to enter the names; but he never put any down. Mr. Reeson subsequently asked him to take the book again; but he declined to enter the names unless the secrecy of his work was removed. He had entered into the original agreement of 1894, and claimed that under it he was entitled to a month's notice of dismissal.

Cross-examined by Mr. NEILSON, witness said he had signed the agreement of 1894, and subsequently to his beginning the new work in 1902 he had on several occasions taken the time of a foreman named Deal; and he supplied his superior officials with the time at which Mr. Deal entered the works daily. He could not give the names of the men who went through the works, as he did not know one in fifty.

In re-examination by Mr. THOMPSON, witness said that no notice to terminate the agreement of December, 1894, had been given to him on behalf of the Company.

Mr. NEILSON said he did not desire to call any witnesses. Knowing that the plaintiff was a very good workman, and having regard to the accident which had happened to him, the Company said that if he would go back to their employment, they would give him lighter work at a rate of pay which, with his compensation under the Act, would make his wages equal to what they were before the accident. They placed him as watchman at one of the gates at the works, where it was part of his duty to see that no unauthorized persons entered, and also that the men commenced their work punctually. In many large works and factories workmen had to sign their names on arrival; so that this was not an unreasonable requirement. He submitted to the Jury that the question for their consideration was whether the instructions given to the plaintiff were reasonable or otherwise. He also raised a legal point as to whether the agreement of 1894 was binding as against the new hiring contract. Under any circumstances, he submitted that it was not binding, and that the new arrangement made was a weekly contract with the liabilities of such a contract.

Judge SMYLY, in summing up, said it seemed to him that it did not matter much whether the plaintiff's subsequent employment was upon the terms of the agreement of December, 1894, or under the subsequent verbal agreement. Under the former, he was bound to obey the reasonable directions of any officer of the Company; and the same principle applied to a subsequent implied agreement. The questions for the Jury, therefore, were: (1) Was the direction given a reasonable direction?; (2) if so, did the plaintiff refuse to carry it out? Having commented upon the point suggested to the Jury, his Honour said that if they found a verdict for the plaintiff they would be safer in acting under the agreement of 1894 in awarding him a month's compensation than a week's compensation, which he would have been entitled to under the subsequent verbal agreement.

The Jury retired for a considerable time, and eventually returned a verdict for the defendants.

CAMBRIDGE COUNTY COURT—Wednesday, Jan. 28.

(*Before His Honour Judge* SHORTT.)

Water Supply by Meter to Contractors.

This was an action brought by the Cambridge University and Town Water-Works Company against Messrs. Kerridge and Shaw, a firm of builders and contractors of Cambridge, for £24 16s. 7d. for water alleged to have been used in the erection of certain buildings. The initial proceedings were taken some weeks ago, and adjourned.

Dr. COOPER appeared for the Company; Mr. H. ST. JOHN RAIKES for the defendants.

Frederick Freeman, plumber to the Company, gave evidence as to taking the readings of the meter on defendants' works. On March 25, 1902, the index registered a consumption of 220,000 gallons; and on May 27, when he took the meter, the reading was 604,960 gallons. A new meter was put down at zero on May 29, and he read it on June 25. It then registered 12,000 gallons. The consumption during the Michaelmas quarter was 56,000 gallons; the charge being £3 12s. 3d. The meter that was taken was tested by the Company's foreman, and was sent away to be repaired.

Charles Hunt, plumber, said he was in the Company's office when Mr. Kerridge complained of the charge made for the water used at the buildings; and, in consequence, he tested the meter in the presence of Mr. Kerridge's foreman. He passed 500 gallons of water through it, and it registered correctly. This was done three times, and Mr. Kerridge said it was right. He heard Mr. Kerridge complain that the meter had been tampered with by the Company's staff. But it was sent to the makers in the condition in which it was taken up.

Mr. *Herbert Frith*, of Rotherham, said he received the meter produced and tested it by passing 1000 gallons of water through it. The register was accurate.

In cross-examination by Mr. RAIKES, witness said he had had four years' experience of testing, and considered that a pressure of 25 lbs. was sufficient to discover any deficiency in the meter, even if the usual pressure was doubled.

George Neish, foreman of the meter department, deposed that he had had thirty years' experience with meters. He made two tests with the one produced, and obtained the same result with each. He took off the dial top, but there was nothing wrong. During his experience he had had many complaints; but, after giving every facility for testing, people had gone back convinced that there had either been waste or that they had made a mistake. The meter was a high-pressure one—that was to say, it would register under any pressure. The life of a meter was three or four years.

Mr. *W. W. Gray*, Engineer and Secretary to the Company, stated that Mr. Kerridge had an interview with him with reference to the large consumption of water at the buildings in question. On May 29, the meter was tested for the third time in Mr. Kerridge's presence; but he complained that he could not have used all the water, and declared that the meter must have been tampered with by the Company's workmen. Witness resented this, and refused to say anything more to him. The normal pressure of the Company's water was from 40 to 45 lbs. per square inch. In consequence of builders leaving their taps open, and letting the water run to waste, the Company had to make special terms. It cost 2s. 4d. a day for water in the first quarter and 4s. per day in the next quarter.

In cross-examination by Mr. RAIKES, witness said he was not present when the meter was tested. It was true that if it registered against anybody, it would be against the Company, because meters were set 2 per cent. in favour of the consumer. He could not say whether this meter was 2 per cent. in favour of the consumer; he only spoke with respect to a general custom.

This concluded the case for the Company.

Mr. *Charles Kerridge*, examined by Mr. RAIKES, denied saying that he thought the meter had been tampered with. The meter was tested with 500 gallons, and it ran the quantity through correctly. A new meter was put in at witness's request, which registered only a weekly average of 4000 gallons. He never saw any signs of water being wasted.

Cross-examined by Dr. COOPER: Some 70 or 80 men were employed, and any of them might have access to the various pipes.

Charles White, general foreman to the defendants, declared that when the meter was tested it took about 50 minutes to run 500 gallons of water through it.

Mr. *R. E. Middleton*, M.Inst.C.E., said he had not examined the old meter, but formed the opinion that the high figure shown might have been due to the meter getting out of order. He could not, however, tell how it was that the meter had gone so far wrong as it seemed to have done.

Cross-examined: If the meter had been tested, Mr. Kerridge could have found out what the quantity of water was.

His HONOUR, in delivering judgment, said he could not hold mere improbability against correct and positive evidence. Mr. Middleton's evidence negatived anything like a leakage at the time he examined the taps. It had not been proved to his satisfaction that the meter had registered inaccurately. He could not account for the abnormal increase during the quarter, or half year from December, 1901, to May, 1902; and Mr. Middleton, with his unique experience, was not able to throw light on the subject. He ought to add that the very large increase in the number of gallons used on the buildings from December to May was enough to arouse the attention of the defendants, and justify examination and test on their part. He must, however, give judgment for the amount claimed, with costs.

The "Calypso" Trade Mark for Gas-Globes.

In the Chancery Division of the High Court of Justice last Saturday, an action brought by Messrs. Weiss and Biheller against the City Incandescent Gas-Light Company, for an injunction to restrain them from infringing their trade mark "Calypso" for gas-globes, came before Mr. Justice Joyce as a short cause for judgment in default of appearance. Mr. G. G. Solomon represented the plaintiffs. After looking at the minutes, his Lordship said the terms were too wide in some respects, especially having regard to the fact that the defendants did not appear. The order would go in the usual form of an injunction against infringement of a registered design and trade mark, with costs. A similar action to the foregoing, brought by the plaintiffs against the Continental Incandescent Gas-Light Company, came before Mr. Justice Buckley. Here, however, the defendants had entered an appearance, but had not put in any defence. Mr. Solomon said the Company were quite unsubstantial; and he asked for an injunction against them and against Julius Boehm, the Managing-Director, and for delivery up of all globes not clearly distinguishable from those of the plaintiffs. His Lordship made the order, with costs.

Corunna Water-Works Company.

In the Chancery Division of the High Court of Justice last Tuesday, Mr. Justice Buckley had before him the petition of Mr. F. J. Knight, the former Secretary of the above-named Company, and a judgment creditor for £300 for salary due, for a winding-up order. Mr. Eldridge, for the petitioner, said the assets of the Company were a concession from the Municipality of Corunna for the supply of the city with water. The Municipality had threatened to cancel the concession, in consequence of the Company's inability to complete the works. Mr. Abrahams, for the Company, did not dispute the debt, but said that a winding-up order would destroy the only chance the petitioner or anybody else had of getting paid. There were debentures for £22,700, which would come in first, and probably exhaust the whole value of the concession. Mr. Clauson, for debenture-holders, also opposed the petition. His Lordship, commenting on these facts, said the petitioner would be merely cutting his own throat by gaining what he asked for. Accordingly, he dismissed the petition, but, having regard to the hardship under which the petitioner suffered, would do so without costs.

Altering Water Service-Pipes without Permission.

At Fenton, last Wednesday week, a man named M'Mahon was charged with permitting a pipe to be fixed to a certain service without first obtaining the consent of the Staffordshire Potteries Water-Works Company. The prosecution took place under section 19 of the Water-Works Clauses Act, 1863. It was stated that defendant was the owner of four cottages which were supplied with water by means of a service-pipe and a stand-pipe in the entry, which communicated with all four houses. Without the Company's consent or knowledge, the defendant's brother, by means of joining on further service-pipes, arranged a separate supply for each of the cottages. The work was not done by an authorized plumber; and there was no guarantee that it was properly carried out. The pipes were laid to a depth of only 12 or 14 inches; and they were thus liable to be damaged by frost. There might, too, have been great waste of water. In this case, the alterations were discovered almost immediately; and the Company did not allege that mischief had been done. Nor did they impute fraud; for the same amount of water was consumed through the four pipes as was formerly taken through the two taps. Defendant said what had been done was in ignorance of the law. The man employed was competent. He had never done anything but plumbing. A fine of 5s. and costs was imposed.

"Ringing the Changes" with Gas-Meters.

At the Bristol Police Court last Tuesday, Frank Theodore Hyder, a gas-fitter, of 12, Gloucester Road, was summoned by the Bristol Gas Company for having, between the 10th and 12th ult., prevented a prepayment meter from registering the quantity of gas supplied to him. Mr. F. E. Weatherly, who prosecuted, said that what the defendant appeared to have done was to disconnect the prepayment meter, and put in its place an absolute dummy. The discovery of the fraud was made in this way: On the 9th ult. the collector called at defendant's house and took the pennies from the money-box of the meter. If he had followed his usual course, he would not have called again for a month; but as he was passing on the following Monday, he paid another visit. Defendant did all he could to prevent the collector examining the meter; but the officer persisted, and found that the prepayment meter had been taken off, and an old one, which was perfectly useless, put in its place. Defendant asked the collector to say nothing about it, and offered him 10s. He afterwards stated that the meter was damaged, and this led him to make the change. This, however, was absolutely untrue, for it was found to be in good working order, and all the gas defendant was entitled to for the last penny put in had not been consumed. After hearing the evidence, the Chairman of the Bench (Mr. A. N. Price) said that there could be no mitigation of the offence. Penny-in-the-slot machines were undoubtedly of great public benefit, and their use should be encouraged in every way. Under the circumstances, the Bench felt bound to impose the full penalty of £5, with £2 2s. costs, and 2s. 6d. damages, or six weeks' imprisonment.

Claim Arising out of the Panton Street Explosion.

It may be remembered that early on the morning of the 9th of September last, an explosion occurred in an electric light box in Panton Street, Haymarket. The accident, which was noticed in the "JOURNAL" at the time, caused injury to a workman named Kidd, in the service of the Charing Cross and Strand Electricity Supply Corporation, for which he claimed compensation, under the Employers' Liability Act, in an action heard by his Honour Judge Woodfall and a Jury at the Westminster County Court on the 20th ult. Mr. Martin O'Connor and Mr. J. Duncan appeared for the plaintiff; Mr. Longstaff represented the defendants. The facts were as follows: On the morning in question, while the plaintiff was working as a jointer, he was ordered by the foreman in charge, Walter Durston, who happened to be foreman of navvies, to get his breaking tools and go with a mate to the Comedy Theatre and disconnect a cable. It appeared from subsequent information that a fire had broken out in a surface box, owing to the corrosion of the bituminous covering of the cable, thereby exposing it to contact with earth. On arriving in Panton Street, Durston directed the plaintiff to disconnect the cable in the next box towards Leicester Square, only 21 yards from the one where the fire was raging. He at first hesitated to do so, saying it was too near. The foreman then ordered him to get down at once and disconnect, or the whole place would, he said, be blown up. The plaintiff thereupon obeyed, and upon unscrewing the nut a spark was caused, which led to an explosion. Plaintiff was blown a distance of some 3 feet, and his head and right hand were severely injured. Mr. C. Harvery, a consulting chemical engineer, gave evidence to the effect that, in his opinion, the method of ventilation employed was defective and dangerous, and that the upcast shaft system should have been adopted. He also stated that the plugging of the spare ways was not an efficient means of preventing leakage; cement or plaster of Paris should have been used. Mr. Longstaff denied that his clients had been guilty of negligence. Mr. Burstall expressed the opinion that the system of ventilation, which was by means of a cover, was adequate, and that the plugging of the spare ways with wood was efficient. Mr. May, underforeman, said the navvy foreman had no power to instruct plaintiff to do what he did. He had merely limited authority over the jointers. Durston said plaintiff knew that he (witness) had no experiences of the dangers of disconnecting, and that Kidd was not bound to take his instructions. The Jury found: (1) That the methods of ventilation and plugging were defective. (2) That the methods of disconnecting were defective and dangerous. (3) That Durston was the person whom plaintiff was bound to obey, and that his orders were negligent. (4) That the plaintiff was guilty of contributory negligence; but that if he had not obeyed orders he would have been dismissed. (5) That it was not negligence, having regard to the emergency, to obey Durston. They gave a verdict for £150. Last Thursday, his Honour delivered a considered judgment in pursuance of the verdict, and allowed costs. The case was fought at the instance of one of the Insurance Companies.

MISCELLANEOUS NEWS.

THE COST OF MUNICIPAL TRADING.

At the Meeting of the Society of Arts last Wednesday—the LORD CHIEF JUSTICE (Lord Alverstone) in the chair—a paper on the above subject was read by Mr. DIXON H. DAVIES. The following are some extracts from it.

Four years ago, the Society of Arts took the initiative in raising the question of the propriety of the modern departure of our local administration from the British principle that Governments should not be concerned in trade. The Society petitioning the Government for an inquiry, and the Joint Committee of the two Houses of Parliament sat throughout one session, and published a large blue-book of evidence; though, for some reason which is not very clear, they have been deprived of the opportunity of reporting their conclusions. "The Times" newspaper has continued the inquiry (thus affording another example of the superiority of private to governmental enterprise), and has published the results of a most elaborate investigation into the whole subject, in a long series of highly informing articles. The Royal Statistical Society has added to the controversy a notable paper by its late President, the Right Hon. Sir Henry Fowler. Numerous other papers and writers have continued the discussion; and there is now a prospect that the parliamentary inquiry will be reopened.

The subject has grown not only in public prominence, but also in the magnitude of its operations during these four years; but, so belated are the returns of the Local Government Board, it is not possible to give statistics which are less than three years in arrear. Making the best of the available materials, it may be said that the local indebtedness of England and Wales now amounts to upwards of 300 millions—little short of £10 per head of the population. Of this huge sum, as nearly as possible one-half has been raised for undertakings which are classed as reproductive. The serious element in this half of the debt is not its present amount, but its steadily accelerated rate of growth. This element is especially evident in those portions of the debt which have been incurred for definitely trading purposes. To exhibit this, the debt for tramways, electric supplies, housing, and gas has been distinguished from that representing water, cemeteries, harbours, and other more legitimate forms of communal adventure. Roughly, the general local debt doubles itself in twenty years; the strictly trading debt in two years.

Taking a period from 1881 to 1900, and comparing for certain typical cities the increase of the debt and the gross rates with that of the population and the valuation, the growth of population has been outpaced by the growth of the debt by no less than 500 per cent. in Sheffield, and by 85 per cent. both in Liverpool and London, and by that of the rates by as much as 115 per cent. in Sheffield, 180 per cent. in Cardiff, and 250 per cent. in London. The valuation list fails to disclose any increment in the value of the property at all adequate to these heavy sums which have been charged upon it. In Manchester, for instance, the gross amount levied for rates has increased 178 per cent. in the period; but the property rated has only risen 12 per cent. in value. It is, therefore, difficult to discover any sign of pecuniary advantage to compensate for the added burdens. The enormous increase in the amounts levied by the local authorities is obtained not only from a high poundage of the rates, but also from an enhanced assessment of the property.

Before leaving the figures, attention may be called to the increasing extent to which pecuniary responsibility is becoming divorced from control. An examination of the rate-books has been made in two typical northern towns—Sheffield and Manchester. In each case the occupiers of the working-class houses represent more than half the voters' register, while the assessment of the whole of their houses amounts to less than that of the property of the manufacturing, railway, and other companies, who have no vote at all. This disproportion is growing, for in both towns the companies' assessment has increased, in the ten years 1890-1900, upwards of 55 per cent., while the small houses only stand at 10·72 per cent. in Sheffield and 21·77 per cent. in Manchester more than they did ten years before (an increase due to the larger number of workmen's houses); so that while the disfranchised class has to pay half as much again, the artisan ratepayer and voter contributes much about the same as he did ten years ago to the treasury of his town. A democracy surely requires that taxation and representation should go together. The figures show that those who provide the greater portion of the funds for the authority are without any voice at all in the election of the local governors or in the control of their policy. So long as they confined themselves to matters of police, health, and education, no one complained, for these concern all the ratepayers equally. Trading undertakings, on the contrary, are not of equal concern, and the control of them cannot justly be vested except in those who provide the funds for carrying them on. Property qualifications are out of fashion nowadays; but if our municipal institutions are to be saved from the discredit and disaster which unjust practices of this kind will surely bring upon them, means must be found to confine them to the proper functions of government.

On the last occasion, the Society had the advantage of an authoritative exposition of the legal aspect of the subject from the present Lord Chief Justice of England, who pointed out that the investment of the public funds in a trading concern was at common law *ultra vires* and illegal. How, then, the "man in the street" may ask, has it come about that these funds have been so invested to the extent of millions? It is accomplished by means of Private Acts of Parliament, by which direct statutory sanction is obtained for each undertaking. Private Acts are frequently run through the Houses in a more or less hole-and-corner manner; and in order to impose some check, the Borough Funds Act, 1872, was passed. In practice the check is inoperative. It is quite possible to arouse the attention of the electorate to civic matters of general welfare; but the ordinary member of the public refuses to

waste his time over other people's trading concerns. The few who do vote are mainly municipal employees who are beaten up by their own foremen, and at Birmingham they were brought up in gangs, under the personal superintendence of the aldermen and councillors who were Chairmen of the different Committees. In Birmingham, there are said to be about 10,000 persons employed by the Corporation in one capacity or another. The pushing of municipal trading, like any other trading, is left to those persons who are interested in it. Self-interest remains the motive, notwithstanding all the parade of civic patriotism. Self-interest competing in open rivalry is a most useful commercial virtue; but self-interest masquerading in the ermine of impartial authority, intriguing up the back stairs, and demoralizing the impartiality of voters, is a corrupting and degenerating influence.

The slow stifling of trade is not apparent, but it is certainly going on as a consequence of this absorption of commercial opportunities by local authorities. No less a sum than £400,000 was expended by them between 1892 and 1898 in opposing projects of private adventurers in Parliament. This costly and obstinate opposition, undertaken in many cases in order to secure protection for municipal trade, constitutes a very serious hamper upon initiative enterprise in this country. We are accustomed to condemn the picketing activities of the Trade Unions. The corporations are performing much the same function—that is to say, they are continually seeking to deprive men (and their own ratepayers, too) of the opportunity of working according to their own choice of employment. Take the case of electric supplies. The manufacturing community will require to lean on the electric station for their power supply in the near future. They must not be stinted in such an essential respect. Yet here, too, as shown in the last paper, the municipalities ruthlessly suppress competition, and demand an absolute monopoly, apparently regardless of the fact that monopoly involves a great responsibility. Gas is another industry which cannot be starved of capital. Water is a question of hundreds of millions; and there are many more which, though not yet undertaken by the corporations to any great extent, are "upon the list."

Of course, the supporters of the present municipal policy do not admit that the financial risks they are incurring are of a serious nature. They rely, in the first place, upon the profits of the undertakings; and, secondly, upon the sinking funds which they are building up, and which they fully believe will extinguish their indebtedness by regular instalments, and leave them possessed of valuable undertakings clear of burden. Alas for human credulity! In both respects these optimists are the victims of delusion. It is true that the councils duly appropriate balances each year from the various trading accounts to the relief of the rates, and they speak of these balances as profits. As a matter of fact, in most cases they are nothing of the kind. At the Royal Statistical Society, Sir Henry Fowler analyzed the whole of the accounts of the local authorities, and showed that, in order to meet the interest and sinking fund instalments with a margin over of about 10s. per cent., the authorities had cut down the provision for depreciation to ¼ per cent. In a great number of the towns no allowance whatever is made for depreciation; and yet the councillors unblushingly appropriate "profits"! The specious argument is used that the sinking fund is a sufficient provision, and that no further depreciation deduction need be made. The period of the sinking fund varies from 30 to 50 years. In London, it is 42 years generally. But electric machinery has often to be scrapped in eight or ten years if a power or tramway plant is to be kept up to date. To neglect to provide for this antiquation out of each year's revenue is simply to cheat the ratepayer of to-morrow out of his just inheritance, for the sake of keeping things pleasant with the ratepayers to-day. "Dishonest" is not too strong a word for a borough accountant to use in regard to such "profits;" and the sinking fund is fast becoming almost as delusive as the profits.

Having referred to the effect of municipal trading upon the national and civic character, Mr. Davies proceeded to deal in succession with its supposed advantages—viz., (1) That it can be carried on with cheap money; (2) keeps the city for the citizen; (3) is better than the company direction; (4) has regard for the consumers; (5) provides an escape from trusts; and (6) allows of better control. He said that, having regard to social, political, and economic results, it could at least be averred that the intrusion of local authorities into the domain of trade leads to far greater evils than any which their abstention from trade could possibly give rise to. It therefore remained to be considered what means could be taken to put matters upon a sounder footing. He then offered the following suggestions.

1.—Corporations should not be allowed to trade for the purpose of profit. This has the advantage of pleasing the Socialists, to whom the making of a profit seems to be a thing accursed. But even if no profits were made, it would still be unjust to use the credit of the town as a whole in order to establish an industry which will not equally benefit the whole of the citizens.

2.—The disfranchising of municipal employees. This has influential support from within the ranks of orthodox Municipalism.

3.—It has been suggested that some limitation should be placed upon the financial powers of the local bodies. There is precedent for such a limitation both in the municipal law of America and in the Public Health Act, 1875. Section 234 of the Act sets forth that "the sum borrowed shall not at any time exceed, with the balances of all the outstanding loans, . . . in the whole, the assessable value for two years of the premises assessable within the district in respect of which such money may be borrowed." By the New York Constitutional Amendment Act, 1884, "no city shall be allowed to become indebted for any purpose, or in any manner, to an amount which, including existing indebtedness, shall exceed 10 per cent. of the assessed valuation of the real estate of the city." Similar provisions are in force in all the other States. Being part of the Constitution, they are unalterable except by a convention, and are strictly enforced by the Supreme Court of the Union. The limit of the Public Health Act is another example of the manner in which wholesome checks imposed by Parliament upon municipal extravagance are continually set aside and rendered nugatory; for almost every Local Authority's Bill repeals section 234. This should not be allowed.

4.—Short of this, a slight amendment has been proposed by Sir Alexander Henderson, which would undoubtedly do a great deal to clip the wings of municipal adventure. These bodies mainly rely upon trust funds for the absorption of their securities, their parliamentary influence having secured the granting of statutory powers to enable trustees to invest in municipal loans. This power (*vide* Trustee Act, 1893, sec. 1) is as follows: "Trustees may, unless expressly forbidden by the trust instrument, invest in municipal stocks of towns of over 50,000 inhabitants, or County Council stocks issued under Act of Parliament or Provisional Order." The amendment suggested is: "Provided that the debt which any such stock represents does not exceed in the whole the assessable value for two years of the town or county in respect of which the stock is issued." Such an amendment would not only be an act of policy tending to restrict speculation with public funds, but also an act of justice to those interested in trust funds, which it is to be feared are frequently invested under the sanction of the Trustee Act in municipal securities, without any regard being paid to the elements of risk which undoubtedly attend them so long as trading is indulged in.

5.—An effective and independent audit of municipal accounts is urgently required, and a strict and intelligent method of book-keeping by which the "teeming and lading" devices should be put a stop to, and the accounts of each department kept distinct. The present system offers unlimited scope for concealment and financial juggling. In this connection, a humble appeal may be sent up for more prompt statistics. The figures for the year 1901-2 will not be published until March, 1903, so that offences have got stale before they are possible of detection and reproof.

6.—The protection given by the Borough Funds Act (a Bill for the amendment of which in the direction of relaxing the restrictions was brought in last session by Sir Albert Rollit) should be rendered really effective by allowing any ratepayer one vote in respect of every £50 of rateable value, without the limit of the £250 as a maximum. Such an amendment, giving those who have to bear the burden of these undertakings some opportunity of raising their voice against them, would be only reasonable.

7.—The difficulties and the disadvantages of legislative interference would not apply to the check which might be imposed upon the municipalities if the leaders of financial opinion in the country were to assert their influence. The present outlook is one of uncontrolled expansion; this cannot continue without danger to the money position. It is suggested that the situation calls for the serious attention of high banking authorities whose wisdom and foresight have many times before stayed the spread of economic disease, and saved their country from years of disaster and distress. Bankers, and particularly the Bank of England, would be the first to suffer if the corporations were to run too far and a crisis should arise. The present monetary situation affords a legitimate excuse for pulling them up. Increased taxation and a higher standard of living are making themselves felt, and bank deposits are not accumulating too plentifully. The regular industries surely have the first call for banking facilities. Therefore it is respectfully submitted that every attempt by corporations to dip into bank balances, either by direct borrowing or by the issue of bills or receipts for short deposits, should be definitely discouraged, and that such discouragement would be the safest as well as the most timely and efficient check which could be resorted to.

In conclusion, whatever may be the remedy or remedies proper to be applied, it is highly important that some means should be found of stopping a practice which leads to unprogressiveness, arbitrary restrictions, and waste of capital.

The CHAIRMAN, in opening the discussion, said he had received a letter from Sir Edward Clarke, who stated that he hoped they would have a strong Royal Commission before any further trading powers were granted to municipal bodies. The burden of the rates, recklessly increased and unfairly levied, and the debts which would make that burden permanent, were increasing with alarming rapidity. He did not desire to add anything on the legal question to what he had said before. The right of corporations to spend money on undertakings unquestionably depended on statutory authority; and it was exceedingly important that before fresh powers were given the subject should be thoroughly understood, and that the nation and those who pressed for municipal trading should know to what they were leading the country. The gravity of the question was really attested by the enormous figures showing the point which local indebtedness had reached and the ever-increasing burden which had been forced upon them, and which was increasing with great rapidity. He wished to make a remark on a part of the subject which had only been touched upon by Mr. Davies. As an old member of the House of Commons, he wished to say that only those who had been in that House knew the almost unfair weight and power which corporations had in that assembly. It was not only that the local member could not—almost dared not—resist the wishes of a corporation in his constituency, but that all the corporations acted together. When, therefore, an attempt was made to obtain statutory powers for private enterprise, the influence of other municipalities was brought to bear upon other members of the House, through the influence of the Municipal Corporations Association; so that corporations in other places, who had nothing to do with the scheme in question, opposed it because it was thought that it might conflict with municipal trade in the particular place. Thus, very often important questions were not fairly determined on their merits, or fairly discussed. He wished to endorse what had been said as to the necessity of a real audit of all municipal accounts, because they were points which could not be ascertained without a close examination of the books, and which were not disclosed in a synopsis. If municipal trade was being carried on at an excessive rate of profit, it was unfair for the ratepayer not to be informed of it. That was a small evil; but it might be an important one. But the evil on the other side was far greater. It was the impossibility of finding out what had become of the unproductive capital. He trusted a thoroughly representative Royal Commission, independent of parliamentary influence, would be appointed to inquire into the matter; and that it would be composed of men who knew what private enterprise had done and could do.

Other speakers followed, and the discussion was adjourned until next Friday.

SOUTH METROPOLITAN GAS COMPANY.

Half-Yearly Report and Accounts.

The following report of the Directors of this Company for the six months ended Dec. 31 last, with the accounts for this period, will be presented to the proprietors at the ordinary half-yearly meeting on the 11th inst.

The half year has been uneventful except for the continued high price of coal, which keeps up the price of gas. With that exception, the result of the Company's working has been satisfactory. The profit earned is sufficient to pay the full dividend to which the shareholders are entitled under the sliding-scale, and to leave a surplus of £11,177 19s. 1d.

The Directors therefore recommend the payment of a dividend at the same rate per annum as in the previous half year—namely, 5½, or £5 6s. 8d., per cent. They do this the more readily because the reserve fund, which from 1889 to 1891 had been reduced to about £37,000, in order to put off as long as possible an increase in the price of gas, has, by the self-denial of the shareholders in foregoing their full dividends, and to some extent by increments of interest, been increased to the substantial figure of £150,717. The total reserves now amount to £234,000, or not much short of the figures of 1889.

One fact of importance in relation to the high price of coal is that during the winter there has been no difficulty in obtaining supplies. No pressure has been put on the Company's contractors, and the monthly deliveries have been maintained, notwithstanding the exceptional sales to America. This is good evidence that supply at least equalled demand at the time of greatest pressure; therefore lower prices may be expected this year.

During the first three months of the half year, there was the usual satisfactory increase in the consumption of gas; but this was checked by the mild and open weather of the second three months, with the result that the increase for the half year was reduced to 2½ per cent. This, however, furnishes strong and striking evidence that the reduction of the illuminating power from 16 to 14 candles has not caused the consumers to use more gas; and seeing that, to compensate for the lower illuminating power, the price was reduced 2d. per 1000 cubic feet, it is clear that the consumers have been gainers by the transaction. They have burnt no more gas, and they have saved by the resulting lower price about £95,000 in the last twelve months.

Although the sliding-scale was adopted in 1876, its operation is still much misunderstood. Its object was, and its effect has been, to make the consumers really partners with the gas company—the prosperity of the latter being completely identified with the interest of the consumers. The supreme interest of the consumers is cheap gas; and the shareholders are offered an appreciable bonus if the price can be reduced, while they suffer a corresponding fine if it be increased. In the case of this Company, a reduction of 1d. per 1000 feet means a benefit of close upon £48,000 a year to the consumers, and then the shareholders are entitled to an addition of £8000 a year—2s. 8d. per cent.—to their dividends. On the other hand, the dividend must be reduced by £8000 a year for every penny increase in price. Concurrently with the introduction of the sliding-scale, the auction clauses were adopted; and their effect is precisely in the same direction. They make it the interest of the shareholders to raise all new capital at the highest market price—that is, at the lowest rate of interest at the time of issue; and this cheap capital is also directly to the benefit of the consumers as well as the shareholders. This Company, however, has gone farther, and by extending the principle of the sliding-scale to the employees of all ranks, by means of the profit-sharing shareholding arrangement, has secured a triple partnership of consumers, employees, and shareholders—all three interests being made one. The employees have now invested in the Company's stock, and on deposit at interest, the large sum of £170,000, averaging quite £40 per man. The Directors are glad to be able to say that the officers and workmen of all ranks have responded heartily to these efforts to interest them in the good working of the undertaking—no small part of its prosperity being due to their earnestness in the performance of their respective duties; while the cordial and friendly relations that exist between employers and employed leave nothing to be desired.

Two Directors (Sir George Livesey and Mr. Edward Henry Cardwell) and one Auditor (Mr. Charles Mortimer) go out of office by rotation. They are all eligible for re-election, and offer themselves accordingly.

The principal portions of the accounts are as follows:—

The first two statements relate, as usual, to the stock and loan capital. The former sets forth that the standard rate of 4 per cent. is payable on £6,000,000 of stock; while the latter shows that the loan capital, the rate of interest on which is 3 per cent., amounts to £1,780,000. The third statement is the capital account. It stands as follows: Amount received, £4,692,096; nominal amount added by conversion (less premium), £3,087,904—total, £7,780,000. The items of expenditure are as follows:—

Capital account to June 30, 1902		£4,351,361 5 5
Expenditure during half year to Dec. 31, 1902, viz.—		
New buildings and machinery in extension of works	£25,116 1 6	
New and additional mains and services	21,855 13 7	
New and additional meters	17,165 7 0	
New and additional stoves	10,969 13 2	
		75,106 15 3
Total expenditure		£4,426,468 0 8
Balance		265,627 19 4
		£4,692,096 0 0
Nominal amount added by conversion, less premium		3,087,904 0 0
Total		£7,780,000 0 0

The following is the revenue account:—

Receipts.

Sale of gas—		
Michaelmas at 2s. 3d. per 1000 feet	£237,771 4 0	
Christmas at 2s. 3d. per 1000 feet	365,981 7 11	
	£603,752 11 11	
Public lighting, including labour, repairing, and materials	28,971 3 3	£632,723 15 2
Meters in use (249,374)—		
Company's meters at rent: Ordinary, 100,912; slot, 139,113	£25,134 13 6	
Company's stoves at rent: Ordinary, 59,216; slot, 112,631; fires, 15,664	21,123 6 0	46,257 19 6
Residual products—		
Coke, less £2148 16s. 1d. for cartage; £15,987 7s. 2d. for labour, &c.	£168,289 12 11	
Breeze, less £423 12s. 4d. for cartage; £3589 11s. 10d. for labour, &c.	4,610 14 7	
Tar, less £137 12s. 2d. for cartage; £175 13s. 6d. for labour, &c.	26,785 8 2	
Ammoniacal liquor, less £204 4s. 8d. for labour, &c.	2,028 13 6	
Sulphate of ammonia, less £10,595 17s. 5d. for acid, &c.; £3619 15s. 9d. for labour, &c.	44,234 0 0	245,948 9 2
Rents receivable		1,655 11 5
Transfer fees		94 0 0
Total receipts		£926,679 15 3

Expenditure.

Manufacture of gas—		
Coal into store, including £27,208 19s. 9d. for labour	£353,112 4 3	
Purification, including £7249 17s. 7d. for labour	20,512 12 0	
Salaries of Engineer and Officers at works	11,527 14 10	
Wages (carbonizing)	59,302 6 4	
Repairs and maintenance of works and plant, including £54,565 15s. 6d. for labour, less £3333 1s. 6d. received for old materials	99,710 9 6	£544,165 6 11
Profit sharing for 12 months ended Dec. 31, 1902		12,000 0 0
Distribution of gas—		
Repair, maintenance, and renewal of mains and service-pipes, including £14,311 10s. 7d. for labour	£23,923 6 5	
Salaries and wages of officers, including Rental Clerks	13,396 11 9	
Repairing and renewals of meters, including £4735 18s. 2d. for labour	20,414 3 11	
Repairing and renewals of stoves, including £9779 15s. 5d. for labour	17,800 7 1	
Gas fittings (labour)	7,227 16 0	82,762 5 2
Public lamps—		
Lighting and repairing, including £11,374 17s. 8d. for labour		15,473 1 6
Rents, rates, and taxes—		
Rents payable	£979 15 0	
Rates and taxes	36,402 19 0	37,382 14 0
Management—		
Directors' allowance	£1,846 5 9	
Salaries of Secretary, Accountant, and Clerks	2,512 5 8	
Collectors { Ordinary	5,146 3 7	
Collectors { Slot meter	5,354 9 2	
Stationery and printing	2,406 2 5	
General charges	6,194 16 3	
Company's Auditors	112 10 0	23,572 12 10
Law charges	£1,218 18 0	
Parliamentary charges	1,337 4 10	2,556 2 10
Bad debts		2,166 14 8
Pensions and officers' and workmen's superannuation, sick, and accident funds		5,687 6 5
Gas Referees and Official Auditor		339 3 7
Total expenditure		£726,105 7 11
Balance carried to net revenue account		200,574 7 4
		£926,679 15 3

The net revenue account stands as follows:—

Balance from last account	£167,459 1 7
Less dividend for the half year ending June 30, 1902	158,000 0 0
	£9,459 1 7
Amount from revenue account	200,574 7 4
Interest on bankers' balances	228 5 6
	£210,261 14 5
Interest on temporary loan and deposits	£3,033 15 4
,, on debenture stock	26,300 0 0
Divisible profit carried to reserve fund	9,750 0 0
Balance applicable to dividend on the ordinary stock	171,177 19 1
	£210,261 14 5

Following this are the statements relating to the reserve, renewal, and insurance funds. They show that the balances on Dec. 31 last were as follows: Reserve fund, £150,717; renewal fund, £22,679; insurance fund, £72,164.

The statements furnishing manufacturing details are as follows:—

Statement of Coal.

In Store June 30, 1902.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store Dec. 31, 1902.
Tons. 59,619	Tons. 652,533	Tons. 577,482	Tons. 989	Tons. 133,681

Statement of Residual Products.

Description.	In Store June 30, 1902.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store Dec. 31, 1902.
Coke—cwts.	162,454	7,140,382	1,821,215	5,325,922	155,699
Breeze—yards	9,285	139,794	40,186	103,108	5,785
Tar—gallons	223,224	5,635,515	250,342	5,263,954	344,443
Ammoniacal liquor—butts	24,438	169,187	138,220	4,997	50,408

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights (estimated).	Private Lights (per Meter).		
Thousands.	Thousands.	Thousands.	Thousands.	
6,108,573	182,605	5,454,954	5,723,883	21,818

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, £81,602; coke and breeze, £5506; tar, sulphate, and ammoniacal liquor, £19,931; and sundries, £221,911. The figures this time last year were: Coal, &c., £54,603; coke and breeze, £19,512; tar, sulphate, and ammoniacal liquor, £11,804; and sundries, £214,012. A sum of £22,228, workmen's bonuses and savings, has been deposited with the Company; and the total of the officers' superannuation and guarantee funds is £15,565. The figures this time last year were £6105 and £22,607.

GASLIGHT AND COKE COMPANY.

Half-Yearly Accounts.

In the "JOURNAL" last week, we gave the report of the Directors of the above-named Company for the six months ending the 31st of December, which will be presented at the half-yearly general meeting of proprietors next Friday. We now extract some particulars from the accounts accompanying the report.

The statement of capital (stock) sets forth that the total paid up is £9,466,500; added on conversion, £12,176,565—total amount authorized, £21,643,065. The statement of loan capital stands thus: Total paid up, £2,844,000; added on conversion, £1,479,975—total amount authorized, £4,323,975.

The capital account shows receipts (with premiums, £1,586,807) to the amount of £27,553,847 11s. 9d. The expenditure is shown in the following items:—

Expenditure to June 30, 1902		£12,991,426 7 2
Expenditure during the half year to Dec. 31, 1902—viz.,		
Buildings and machinery in extension of works.	£11,042 15 4	
New and additional mains and service-pipes	13,270 6 1	
Do. do. meters	12,563 17 8	
Do. do. stoves	17,794 2 10	
		54,671 1 11
		£13,046,097 9 1
Sale of surplus land	£12,198 16 2	
Sale and depreciation of plant	12,244 1 3	
Depreciation fund	9,600 0 0	
		34,042 17 5
Total expenditure		£13,012,034 11 8
Nominal amount added on conversion		13,656,540 0 0
Balance of capital account		885,253 0 1
		£27,553,847 11 9

The following is the revenue account:—

Expenditure.

Dec. Half Year, 1901.		£ s. d.	£ s. d.
	Manufacture—		
£827,327	Coals, including oil, dues, carriage, unloading, and trimming	661,934 7 10	
14,579	Salaries of engineers and other officers at works	15,902 5 0	
146,155	Wages, gas making £124,760 18s. 8d.	142,332 1 9	
18,030	,, sundries £17,571 3s. 1d.		
50,468	Purification, including £18,534 2s. 5d. for labour	48,227 7 9	
220,817	Repair and maintenance of works and plant, materials and labour, less received for old materials, £4195 0s. 4d.	184,481 10 9	
	Distribution—		1,052,877 13 1
33,423	Salaries and wages of officers (including Rental Clerks)	34,436 14 0	
36,394	Repair and maintenance of mains and service-pipes	41,902 7 6	
25,847	Repair and renewals of meters	26,157 7 10	
32,094	Stove fixing, repairs, and renewals	28,285 9 11	
4,723	Gas fittings (automatic meter supplies)	..	
			130,781 19 3
17,809	Public lamps—Lighting and repairing	..	16,624 17 10
	Rents, rates, and taxes—		
6,223	Rents payable	6,022 6 3	
139,640	Rates and taxes	137,659 11 7	
			143,681 17 10
	Management—		
2,750	Directors' allowance	2,750 0 0	
223	Company's Auditors and Assistant	212 12 0	
11,468	Salaries of Secretary, Accountant, and Clerks	11,609 4 7	
21,656	Collectors' commission	21,483 16 11	
6,774	Stationery and printing	7,653 2 11	
3,362	General charges	3,037 17 2	
			46,746 13 7
1,117	Parliamentary charges	..	207 6 6
598	Law charges	..	1,526 13 4
5,810	Bad debts	..	4,812 15 1
500	Depreciation fund for Works on Leasehold Lands	..	500 0 0
15,531	Annuities	..	15,776 14 9
1,423	Workmen's compensation account	..	1,593 0 6
..	Stamp duty on increase of nominal capital under the Company's Act, 1898, on account	..	5,000 0 0
	Public officers—		
862	Gas Referees and Official Auditor	782 15 7	
640	Public testing-stations	719 13 9	
			1,502 9 4
£1,646,443			1,421,632 1 1
499,157	Balance carried to net revenue account		525,618 4 3
£2,145,600			1,947,250 5 4

Receipts.

Dec. Half Year, 1901.		£ s. d.	£ s. d.
	Sale of gas—		
£1,633,999	Common gas, per meter, at 3s. and 2s. 5d. per 1000 cubic feet	1,458,002 11 2	
78,943	Public lighting and under contracts— Common gas	76,541 11 11	
£1,712,942			1,534,544 3 1
26,621	Rental of stoves	..	28,283 2 2
	Residual products—		
£267,961	Coke, less £37,761 18s. 4d. for labour, &c.	217,005 18 7	
10,933	Breeze, less £3021 13s. 7d. for ditto	12,403 2 11	
55,188	Tar and tar products	52,014 9 6	
66,902	Ammoniacal liquor and sulphate of ammonia	68,223 18 0	
£400,974			379,647 9 0
£4,815	Rents receivable		4,517 1 1
248	Transfer fees		258 10 0
£2,145,600			1,947,250 5 4

The net revenue account stands as follows:—

Dec. Half Year, 1901.		£ s. d.	£ s. d.
£429,751	Balance from last account	373,029 8 1	
331,757	Less dividend on the ordinary stock for the half year to June 30, 1902	304,864 0 0	
£97,994			68,165 8 1
499,156	Revenue account	..	525,618 4 3
£597,150			£593,783 12 4

Dec. Half Year, 1901.		£ s. d.	£ s. d.
£68,594	Interest on debenture stock and bonds, accrued to Dec. 31, 1902	..	69,409 12 6
75,998	Dividend on the preference stocks	75,997 19 0	
45,500	Dividend on the 3½ per cent. maximum stock	45,500 0 0	
			121,497 19 0
8,070	Interest on temporary loans and sundry funds, less credits	..	2,378 13 6
398,988	Balance applicable to dividend on the ordinary stock	..	400,497 7 4
£597,150			£593,783 12 4

The balance available for division is £400,497 7s. 4d.; and the statement showing how it is proposed to appropriate it is as follows:—

Dec., 1901.		
£97,994	Net balance brought from last account	£68,165 8 1
300,994 ..	Net revenue for the half year	332,331 19 3
£398,988		£400,497 7 4
(£4 8s. per cent.)	A dividend on the ordinary stock—	
£334,154 ..	£4 8s. per cent. per annum on £15,243,200	335,350 8 0
£64,834 ..	Balance carried to next account	£65,146 19 4

The three statements relating to the reserve, insurance, and depreciation funds show that the balances on Dec. 31 were as follows: Reserve fund, £55,739; insurance fund, £89,840; and depreciation fund, £52,446. The insurance fund had to bear in the past half year a sum of £35 11s. 1d., the value of plant destroyed by fires in the Company's district; and from the depreciation fund a sum of £9600 was placed to the credit of the capital on the sale of leasehold land at Pimlico.

Statement of Coal Used, &c.

Description of Coal.	In Store June 30, 1902.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store Dec. 31, 1902.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	133,024	999,805	841,653	1,817	289,359
Cannel	15,476	4,511	*2,770	..	17,217
Total	148,500	1,004,316	844,423	1,817	306,576

* In addition to this quantity of cannel, 7,401,512 gallons of oil and spirit were used during the half year.

Statement of Residual Products.

Description.	In Store June 30, 1902.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store Dec. 31, 1902.
Coke—tons	12,699	527,769	115,322	418,482	6,664
Breeze—tons	1,550	71,441	13,555	57,636	1,800
Tar—gallons	747,547	8,461,781	8,322,724	23,107	863,497
Ammoniacal liquor—butts	12,392	254,021	246,173	..	20,240

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights and Under Contracts. (Estimated.)	Private Lights (per Meter).		
Thousands.	Thousands.	Thousands.	Thousands.	
* 10,923,240	503,841	9,815,631	10,469,343	48,876
† 11,031,323	522,956	9,840,316	10,511,472	49,806

* Including 2,330,390,000 cubic feet of "oil gas." † December half year, 1901.

The last statement is the general balance sheet. It shows that the value of the stores on hand on Dec. 31 last was as follows; Coals, £214,775; oil and petroleum spirit, £35,733; coke, £3954; tar and ammoniacal liquor and products, £83,480; sundries, £229,685—total, £567,627. The figures for the corresponding period of 1901 were: Coals, £179,566; oil and spirit, £58,259; coke, £25,320; tar, &c., £101,623; sundries, £255,437 – total, £620,205. The item "automatic meter supplies (balance of fittings account)" amounts to £111,918, compared with £165,948 at the close of the six months ending Dec. 31, 1901.

MAIDSTONE GAS COMPANY.

Conversion Scheme—The Recent Explosion.

A Meeting of the Maidstone Gas Company was held last Thursday week—Mr. GEORGE MARSHAM in the chair—for the purpose of considering the Bill which it is proposed to promote in the next session of Parliament, for the conversion of the existing capital and the raising of further money.

The CHAIRMAN said the business of the Company was steadily developing, and it had become necessary to raise further capital. The capital authorized by the Act of 1880 and the borrowing powers obtained by the Provisional Order of 1896 had been utilized to the best advantage. Having to apply to Parliament for power to raise capital, they had taken the opportunity to look ahead to see what other points there were upon which they could get assistance. They had consulted Sir George Livesey; and he advised that they should take the opportunity of converting their capital into 5 per cent. stock. He also advised that they should increase their stability by giving their customers and their employees the first offer of new stock before issuing it to the public. He further advised a lower illuminating power than the present 15 candles. They therefore proposed to ask for 13 candles as their limit, instead of 15 candles. But, in order to prevent any complaint from their customers as to the quality of the gas, they agreed by the new Bill to fix suitable burners free of charge whenever required; and this would apply to the consumers by slot meters as well as to ordinary customers. Their initial price in the past had been 3s. 8d. per 1000 cubic feet; and if they reduced the power to 13 candles, it would be 3s. 6d. It was also thought advisable to extend their limits of supply. At present, these limits were defined as being 3 miles from the Town Hall. They had been approached from time to time as to supplying other places beyond, but had no power to do so. They therefore proposed that their limits in future should be 4 miles from the Town Hall; and they also wished to include the parishes of Leeds and Hollingbourne, so as to give them power hereafter to agree with the Hollingbourne Gas Company, if thought advisable, to take over the undertaking. What they proposed was that from Jan. 1, 1904, the present 7 per cent. consolidated stock of £87,600 should be converted into stock to be called 5 per cent. capital stock of the nominal amount of £122,640—being £140 of new stock in respect of every £100 of old stock. The dividend on the new stock would vary in accordance with the new sliding-scale. At the present time, the dividend on £87,600, with gas at 2s. 5d. per 1000 cubic feet, amounted to £9417; while under the new Act, with gas at 2s. 3d. and a reduced illuminating power, the corresponding dividend would be £7 12s. 6d. per cent. on £122,640, or £9351 6s. This showed a decrease of £65 14s. in dividend. What, it would be asked, were the advantages of the conversion? People with money to invest preferred 5 per cent. stock; and it had been a very general thing with gas companies in recent years to convert their stock. Moreover, with the larger nominal capital, they had a better prospect of a quotation on the Stock Exchange; and with their capital spread among consumers and employees of the Company, their position would be strengthened. The extension of the limits of supply to 4 miles would involve a somewhat heavy cost in laying mains in outlying parishes; and therefore they proposed to have differential prices. Beyond the borough of Maidstone and outside a 1½ miles radius from the Town Hall, an additional 9d. per 1000 cubic feet was to be charged. This would make the price under the new conditions 2s. 3d. per 1000 cubic feet in Maidstone, and 3s. in the outlying parishes. They had had no power in the past to charge any additional price for outlying places, and they had therefore been obliged to refuse to supply Barming, because there was no way of recouping themselves the initial expense. He proposed that the Bill be approved of.

Mr. W. BRYANT seconded the motion; and it was carried.

A further Meeting was subsequently held to consider what steps should be taken with regard to settling the liability for the damage done by the recent explosion on Maidstone Bridge.

The CHAIRMAN said there was no doubt the sufferers by the accident should be compensated—by whom he was not at present prepared to state. He was, however, glad to say that this matter had been removed for the present, because, rightly or wrongly, the Company were prepared to meet them. The question of the repair of the bridge was on quite a different plane. He himself considered that it was a case for settlement. He had endeavoured to arrange an interview with the Mayor for this purpose; but the proposal had been declined. His opinion was that the contributory negligence on the part of the Corporation had its share in the unfortunate explosion; and he was quite prepared to give them some of his points. They were facts which they would be obliged to show if they were called upon to defend themselves. First, the bridge was not ventilated in accordance with the original plans; the intention to ventilate being understood by the Directors according to a letter written at that time, and which they had in their possession. If the bridge had been ventilated, there would have been no explosion. Secondly, the cavity was not filled in with sand or anything else. If it had been, there would have been no explosion. When the bridge was built, though the Company, Mr. Marsham believed, put down the mains, they had no responsibility with regard to them. The Engineer of the bridge was a Gas Engineer (Mr. Law); and therefore he was the man who was responsible for the way in which it should be done. Thirdly, the cable was laid across their main against the rule of the Board of Trade; and proper notice was not given to the Company, in accordance with the rules of the Electric Lighting Order. Fourthly, while notice was sent to the electric light works the same evening that smoke was seen coming from below the arc of the lamp on the bridge at 6 p.m., no steps were taken to put out the light. These were strong arguments, and were mentioned for the first time to the shareholders.

Mr. STYLES said he took it that the Chairman admitted contributory cause on the part of the Company. Without the escape of gas, there would have been no explosion. Morally, the Company admitted there was some obligation in reference to the sufferers. They had done this by generously contributing to their assistance.

Mr. EDMETT said that, supposing they admitted it was an explosion of gas in the cavity, there were two 18-inch iron mains crossing the bridge, and iron was always affected by the temperature. In the cold weather it contracted, and in the hot weather it expanded; and it was therefore impossible to avoid some small escape of gas at times. But any little escape should not be allowed to accumulate in a sealed chamber. This, it seemed to him, was a very important factor. The explosion might have happened from a mixture of air and gas without any fault falling upon the Company.

Mr. COX said it would be sad if litigation followed; and he was sorry the matter had not been settled in an amicable way. Litigation meant the expenditure of more money than the job would take to put right; and, as townsmen, they ought to consider this. He thought it would be better if a deputation met the full Corporation. The *crux* of the whole matter was the cavity on the bridge. When the bridge was built, he gathered that the mains were not only laid under the Corporation's supervision, but that they paid for the pipes as well.

The SECRETARY (Mr. R. Hoar): Yes; in place of the pipes taken away from the old bridge.

Mr. COX (continuing) said that, had there not been a cavity, there would have been no explosion; and this, he believed, was the point. He moved "that it be referred to the Directors to approach the Town Council again on the subject, with full power to arrive at an amicable settlement of the claim."

The motion was carried, and a vote of thanks was passed to the Chairman for the trouble he had taken in the matter.

COMPETITION FOR THE PARIS GAS SUPPLY.

Our readers are aware that certain American capitalists, representing the People's Gas Company of Chicago and the Consolidated Gas Company of New York, have been for the past few weeks in Paris, endeavouring to conclude negotiations for carrying on the gas supply at the expiration of the Company's concession in 1905. There appears to be keen competition for this privilege, for several schemes have been put forward. M. Chamon, who is a prominent member of a meter manufacturing firm, adopts in a modified form the scheme submitted to the Municipal Council, and offers to supply gas at 20 c. per cubic metre to the ordinary consumers, at 18 c. to manufacturers, and at 15 c. to the city. The same charges are suggested in the project of MM. Benard and Jarislowski, bankers; in that of M. Pernolet, who is said to be supported by the Comptoir d'Escompte; and in that of M. Thiercelin. The Association of Gas Consumers in Paris offer a supply at 17 c. and 10 c. per cubic metre for ordinary consumers and the Municipality respectively; while MM. Devaluez and Duchannoy, who are said to represent the Rockefeller interests, propose a uniform price of 15 c., with a concession for thirty years. A similar scheme to the latter emanates from MM. Perier, Marcet, et Cie, bankers. An entirely new project is proposed by MM. T. Gambier and J. Bernard, who ask for a fifty years' concession, and suggest the establishment of gas-works near the pit's mouth and the transmission of the gas under pressure to Paris. The authors of this scheme offer to furnish gas to the Municipal Council at 5 c. per cubic metre for resale, at 10 c. for domestic, and at 6 c. for industrial purposes.

NEW SULPHATE PLANT AT DEWSBURY GAS-WORKS.

A new sulphate of ammonia house, which has been fitted up with improved plant, has just been erected at the Dewsbury Corporation Gas-Works. All the work in connection with it has been carried out under the direction of Mr. C. A. Craven, Assoc.M.Inst.C.E., the Gas Engineer and Manager to the Corporation, who designed the works, in the construction of which the materials of the old building were utilized. The new block presents a very substantial appearance, and is a great improvement upon the old structure. Entirely new plant has been supplied by Messrs. Goddard, Massey, and Warner, Limited, of Nottingham; the saturator being by Messrs. Joseph Taylor and Co., of Bolton. Hitherto the intermittent system has been in operation; but this has been abandoned for the continuous principle, which is much more satisfactory—only one boiler operation being necessary, instead of two as formerly. The liquor is run from a storage-tank into a special regulating-tank, giving the exact head required for feeding the stills. No hand pumping is necessary; and the sulphate, as produced, is discharged from the bottom of the saturator by simply opening a valve. The drying-table is of lead, and the liquor runs off from the sulphate back again into the saturator. As the material dries, or as the table fills, it is shot into a large and specially constructed bag, with a bottom so arranged that any remaining liquor can percolate through it into a receiving well, from which it is pumped up again as required. All the apparatus works automatieally, and the labour in connection with the process is reduced to a minimum. The building and plant have cost about £1400.

ELECTROLYSIS QUESTION IN AMERICA.

We learn from the "Engineering Record" that the City Council of Atlantic City (N.J.) recently passed an ordinance stating that "any company or individual operating a street railway within the limits of the city shall, on or before Feb. 1, 1903, take adequate measures to completely prevent injury to water-mains, service-pipes, and other metallic structures, on account of electrolysis, and shall file with the Water Department of the city details of the plans adopted to accomplish this result." In the case of new lines of track, the plans are to be filed before the construction is commenced. In no case will bonding to the water-mains or other conductors, not provided for the express purpose, be allowed in order to equalize the potential between such conductor and the rail; but means must be taken, by furnishing and insulating a complete metallic circuit both inside and outside the city limits, to effectually prevent leakage of current from the wires or rails of the railway. The company or individual operating the street railway may select the particular method of securing this protection, and will be held responsible only for the result.

The ordinance sets forth, in the second section, that any company or individual operating a street railway within the limits of the city shall "so confine its current to the metallic return circuit which it shall provide, as to comply with the following conditions: (1) The maximum difference in potential between any part of the metallic return circuit and any water or service pipe, or other metal conductor not intended as a part of such return circuit, shall not at any time exceed $\frac{1}{4}$ volt. (2) The difference in potential between any two points upon the metallic return circuit within a distance of 200 feet from each other shall not at any time exceed $\frac{1}{4}$ volt. (3) The current passing along any water or service pipes or other metallic conductor not intended as a part of said return circuit shall not at any given time and point exceed one ampere."

The ordinance provides for inspections in February and August of each year, to determine whether the ordinance is being complied with; these inspections to be conducted by an expert to be agreed upon by the Railway Company and the Engineer and Superintendent of the Water Department. On failure to agree on an expert, the test is to be made by the City Electrician. Failure to effectually remedy without delay the cause of any electrolytic damage constitutes a violation of the ordinance, and the company are to be subject to damages amounting to the cost of discovering and repairing the injury.

It is further ordained that any company or individual who violates the terms of the ordinance, or refuses to comply therewith, shall, upon conviction, be subject to a fine of not less than $50 and not more than $200 and the costs of prosecution, and shall be deemed guilty of a separate and distinct offence for every day during which such violation or failure continues. The payment of the penalty in no way releases the company or individual from the obligation to make compensation in full for any damage done to water or service pipes, or other me tallic conductors, by reason of the escape of electric currents from the wires or other appurtenances of the railway.

Mr. Kenneth Allen, the Engineer and Superintendent of the Water Department, states that it was not deemed best to prescribe the means to be adopted in order to prevent electrolysis, but to frame the ordinance so as to place the responsibility for the result entirely with the Railway Company; and the requirements are sufficiently severe to enable the city to demand the adoption of the double trolley system, should dangerous electrolytic action not be otherwise eliminated.

NEW JOINT STOCK COMPANIES.

Messrs. George Bray and Co. a Limited Company.

A Company has been registered, with a capital of £160,000, in £1 shares (80,000 preference), to acquire the business carried on by Mr. G. Bray, as "Geo. Bray and Co.," of Bagby Works, Leeds. The objects of the Company are described as "the carrying on of the businesses of lighting, heating, and electrical engineers, manufacturers of, and dealers in, burners, lamps, fittings, stoves, and other appliances for the use of gas, acetylene, electricity, steam, water, or other illuminant force, medium, or method for lighting, cooking, or motive power." The subscribers are: Mr. George Bray, Mr. J. W. Bray, Mr. A. Bray, Miss F. Bray, Mrs. M. I. Bray, and Mrs. E. A. Bray, all of Leeds, and Mrs. A. Simpson, of London. There will be no initial public issue. The first Directors are Messrs. George, J. W., & A. Bray (all permanent). Mr. George Bray is Governing Director, and he may, while holding one-third of the issued capital (including debentures or debenture stock), appoint and remove Directors. He may appoint two Directors by will, if he hold one-third of such capital at the date of his death, or one Director if holding one-fifth.

The Cribbwr Coke Company, Limited, has recently been formed, with a capital of £3000 in £1 shares, to acquire the business conducted at the Cribbwr Coke Works, Tondu, near Bridgend, Glamorganshire, by W. A. Boyle, and to carry on the trade of manufacturers of, and dealers in, coke, coal, gas, oil, tar, patent fuel, and bye-products of coal or coke, &c. The Lucal Light and Heating Company, Limited, has been formed, with a capital of £5000 in £1 shares, to acquire the business of manufacturing lamps, &c., carried on by Lucal, Limited, at Waterloo Street, Glasgow. The North-Western Electricity and Power-Gas Syndicate, Limited, has been registered, with a capital of £10,000 in £100 shares, to promote, or aid in promoting, a Bill for carrying on throughout Cheshire, that portion of Staffordshire lying north of the southern boundary lines of the rural districts of Tutbury, Uttoxeter, Stafford, and Gnosall, that part of Derbyshire lying north-west of Chapel-en-le-Frith and Bakewell, and elsewhere, the business of an electricity and power-gas supply company in all its branches.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 284.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 15	10½	Alliance & Dublin 10 p.c.	18—19	..	5 10 6
100,000	10	,,	7½	Do. 7 p.c.	12½—13½	..	5 11 1
200,000	5	Nov. 13	6½	Bombay, Ltd.	5⅝—6⅛	..	5 4 0
40,000	5	,,	6½	Do. New, £4 paid	4¼—4⅝	..	5 9 5
380,000	Stk.	Aug. 14	12	Brentford Consolidated	247—252	..	4 15 3
270,000	,,	,,	9	Do. New	182—187	..	4 16 3
50,000	,,	,,	5	Do. 5 p.c. Pref.	136—141	..	3 10 11
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb.	110—113	..	3 10 10
220,000	Stk.	Sept. 11	10	Brighton & Hove Orig.	209—214	..	5 0 4
246,320	,,	,,	7	Do. A. Ord. Stk.	155—160	..	4 16 11
460,000	20	Sept. 26	10	British	39½—40½	..	4 18 9
50,000	10	Aug. 14	12	Bromley, Ord. 10 p.c.	—	..	—
82,850	10	,,	9	Do. 7 p.c.	—	..	—
500,000	10	Oct 15	7	Buenos Ayres (New) Ltd.	10¼—10⅝	..	6 10 3
250,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	92—94	..	4 5 1
150,000	20	July 11	8½	Cagliari, Ltd.	23—25	..	6 12 0
100,000	10	Sept. 26	10	Cape Town & Dis., Ltd.	15—16	..	6 5 0
50,000	50	Nov. 3	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
550,000	Stk.	Oct. 15	12½	Commercial Old Stock	—	..	—
251,875	,,	,,	9½	Do. New do.	—	..	—
271,875	,,	Dec. 11	4½	Do. 4½ p.c. Deb.	—	..	—
800,000	Stk.	Dec. 11	8	Continental Union, Ltd.	128—133	−4	6 0 4
200,000	,,	,,	7	Do. 7 p.c. Pref.	140—145	..	4 16 7
575,000	Stk.	Aug. 28	5⅜	Crystal Palace Ord. 5 p.c.	117—122	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	..	4 0 0
106,158	,,	Jan. 15	5	Do. 5 p.c. Deb. Stk.	137—140*	..	3 11 5
486,090	10	Jan. 29	10½	European, Ltd.	17½—18½*	..	5 13 6
354,060	10	,,	10½	Do. £7 10s. paid	13—14*	..	5 12 6
15,243,200	Stk.	Aug. 14	4 1/10†	Gas-light and Coke	4 p.c. Ord.	87—89	−1	4 18 10
2,600,000	,,	,,	3½		3½ p.c. max.	88—90	+1	3 17 9
3,799,735	,,	,,	4		4 p.c. Con. Pref.	108—111	−½	3 12 1
4,193,975	,,	Dec. 11	3		3 p.c. Con. Deb.	91—93	−1	3 4 6
252,500	Stk.	Sept. 11	5	Hastings & St. L. 3½ p.c.	90—95	..	5 5 3
70,000	10	Oct. 30	8	Hongkong & China, Ltd.	14½—15½	..	5 3 3
3,800,000	Stk.	Nov. 13	10	Imperial Continental	206—209	..	4 15 8
473,600	Stk.	Aug. 14	3½	Do. 3½ p.c. Deb. Red.	99—101	..	3 9 4
158,212	Stk.	Aug. 28	6	Lea Bridge Ord. 5 p.c.	115—120	..	5 0 0
561,000	Stk.	Aug. 28	10	Liverpool United A	224—226	..	4 8 6
718,100	,,	,,	7	Do. do. B	165—167	..	4 3 10
306,083	,,	Dec. 31	4	Do. do. Deb. Stk.	114—116	..	3 9 0
75,000	5	Dec. 11	5	Malta & Medn., Ltd.	4—4½	..	5 11 1
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	105—109	..	4 11 9
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	103—105	..	4 5 9
541,920	20	Nov. 13	3½	Monte Video, Ltd.	9½—10⅛	..	6 13 4
1,515,892	Stk.	Aug. 8	4½	Newc'tle & G'tesh'd Con.	104½—105½	..	4 5 4
346,855	Stk.	Jan. 2	3½	Do. 3½ p.c. Deb.	97—98	..	3 11 5
300,000	Stk.	Nov. 27	8	Oriental, Ltd.	143—148	..	5 8 1
60,000	5	Sept. 26	7	Ottoman, Ltd.	6¾—7	..	5 0 0
					* Ex. div.		
£			p.c.	GAS COMPANIES.			£ s. d.
105,005	Stk.	Jan. 15	6½	Ply'mth & St'house 5 p.c	123—128*	..	4 15 9
851,070	10	Oct. 15	7	River Plate Ord.	10½—11		6 7 3
300,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	93—95	+1	4 4 3
250,000	10	Sept. 26	8	San Paulo, Ltd.	11⅝—12½	..	6 8 0
135,000	Stk.	Sept. 11	10	Sheffield A	236—238	..	4 4 0
209,984	,,	,,	10	Do. B	233—235	..	4 5 1
523,498	,,	,,	10	Do. C	233—235	..	4 5 1
103,235	Stk.	Sept. 26	5	Shrewsbury Ord. 5 p.c.	113—116	..	4 6 2
6,000,000	Stk.	Aug. 14	5⅜	South Met., 4 p.c. Ord.	122—124	..	4 6 0
1,700,000	,,	Jan. 15	3	Do. 3 p.c. Deb.	91—93*	..	3 4 6
380,940	Stk.	Nov. 13	5	Southampton Ord.	103—107	..	4 13 6
87,950	,,	Jan. 15	4	Do. 4 p.c. Deb.	100—103*	..	3 17 8
120,000	Stk.	Aug. 28	6	Tottenham and Edmonton A. 5 p.c.	118—123	..	4 17 7
300,520	,,	,,	4½	B. 3½ p.c.	93—96	..	4 13 9
182,380	10	Dec. 30	5	Tuscan, Ltd.	8½—9½	..	5 5 3
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	94—96	..	5 4 2
230,000	5	Aug. 14	6½	West Ham, 10 p.c.	—	..	—
172,000	10	,,	6½	Do. 7 p.c.	—	..	—
				WATER COMPANIES.			
780,662	Stk.	Dec. 30	11½	Chelsea, Ord.	315—325	..	3 10 9
150,000	,,	,,	5	Do. 5 p.c. Pref.	150—155	..	3 4 6
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	138—143	..	3 2 11
175,785	,,	Sept. 26	4½	Do. 4½ p.c. Deb.	140—145	..	3 2 1
1,720,560	Stk.	Oct. 15	8	East London, Ord.	228—233	..	3 8 9
654,740	,,	Dec. 11	4½	Do. 4½ p.c. Deb.	142—147	..	3 1 3
1,282,943	,,	,,	3	Do. 3 p.c. Deb.	97—99	..	3 0 7
700,000	50	Dec. 11	8	Grand Junction 10 p.c. max.	115—120	..	3 6 8
310,000	Stk.	Sept. 26	4	4 p.c. Deb.	125—130	..	3 1 7
708,000	Stk.	Aug. 14	14	Kent	305—315	..	4 8 11
160,000	,,	,,	7	Do. New, 7 p.c. max.	200—210	..	3 6 8
1,043,800	100	Dec. 30	11	Lambeth, 10 p.c. max.	305—315	..	3 9 10
406,200	100	,,	8½	Do. 7½ p.c. max.	220—230	..	3 13 11
350,000	Stk.	Sept. 26	4	Do. 4 p.c. Deb.	125—130	..	3 1 7
500,000	100	Aug. 14	12 1/10	New River, New Shares	395—405	..	3 3 2
1,000,000	Stk.	Jan. 29	4	Do. 4 p.c. Deb.	125—130*	+2	3 1 7
902,300	Stk.	Dec. 11	7	South-wark and Vauxhall Ord.	207—212	..	3 6 0
126 500	100	,,	7	7½ p.c. max.	200—210	..	3 6 8
489,200	Stk.	,,	5	5 p.c. Pref.	151—154	..	3 4 11
1,019,585	,,	Oct. 15	4	4 p.c. A Deb.	125—130	..	3 1 7
1,155,066	Stk.	Dec. 11	10	West Middlesex	295—305	..	3 5 7
200,000	,,	,,	4½	Do. 4½ p.c. Deb.	140—145	..	3 2 1
200,000	,,	Sept. 11	3	Do. 3 p.c. Deb.	97—99	..	3 0 7
					* Ex. div.		

† Next dividend will be at this rate.

ELECTRIC LIGHTING NOTES.

Failure at Nottingham.

Between one and two o'clock in the afternoon of Saturday, the 24th ult., Nottingham became enveloped in darkness, and great inconvenience was caused owing to the failure of the electric light at that particular time. Many business places were crowded when the accident happened; and tradesmen had, in numerous cases, to light their establishments by means of candles and gas.

Ludlow's Trouble.

The Board of Trade have written refusing consent to the Ludlow Corporation selling their Electric Lighting Provisional Order to a local Company for £225. When a Special Committee of the Town Council submitted a scheme for the Corporation to carry out, the voting was equal for and against; and it was subsequently resolved to transfer the powers to a Company, if the consent of the Board of Trade could be obtained. As this has been refused, the Council will have to act themselves under the Provisional Order, failing which it will be revoked, and anybody will be at liberty to step in and apply for parliamentary powers.

Profits at Liverpool.

At the last meeting of the Liverpool Electric Lighting Committee, the accounts for the past year were submitted. They show a net balance of £33,415. The Committee resolved to recommend the Council to adopt the following principle in dealing annually with any surplus profits of the Electricity Department: That until the reserve funds amount to the limit fixed by the Board of Trade of 10 per cent. on the capital expenditure of the undertaking, (1) any sum not exceeding 1 per cent. on the capital expenditure be added to the reserve funds, (2) two-fifths of any profits in excess of the above sum to be added to the reserve funds, and three-fifths to be used in aid of rates. The Committee also passed a resolution that the sum of £10,000 be transferred to the reserve fund, £11,386 to the renewal fund, and £12,029 to the general rate. Irrecoverable accounts amounting to £288 were written off.

Proposed Electric Lighting Scheme for Dungannon.

Mr. P. C. Cowan, M.Inst.C.E., recently inquired into an application made to the Local Government Board for Ireland by the Dungannon Urban District Council for a loan of £6000 for electric lighting purposes. The proposal was objected to on the ground that it would throw a burden upon the rates. Among the witnesses for the opposition was Mr. S. Clugston, the Secretary of the Gas Company, who gave an account of the progress of the undertaking. He stated that in August, 1900, owing to the high price of coal, the Company had to raise their charge to 5s. 10d. per 1000 cubic feet. They then proposed to light the town for £150 for the season, and to provide two lamplighters. Since then the Council had used oil for public lighting; but it was very much inferior to gas. The price had been reduced to 5s. 5d. after the Council had obtained their Provisional Order, and they now offered to reduce it still further to 4s. 8d. Mr. R. Stevenson, jun., produced a list of ratepayers who had signed a protest against the scheme on the ground that it would increase the rates. He, however, said he was willing to pay an additional rate of 6d. in the pound to have better light, but thought that two or three, or even four, sixpences, would not meet it. On behalf of the Council, Dr. J. O. Wylie, K.C., contended that the scheme had been clearly proved, and said the best evidence they had was that produced from the other side, which was that nearly everyone in the town would use the electric light provided it cost less than gas. The Council of 21 members was elected on the question, and the only supporter of the Gas Company was put off. The Council were unanimous; and this fact made a very strong case The inquiry then terminated.

A Start at Barnstaple.

The electric lighting works established by the Barnstaple Corporation were formally inaugurated on Thursday last, when the Mayoress (Mrs. Barrett) switched on the light for the first time, and the streets in the centre of the town were lit by electricity. The undertaking has been carried out from the plans of Mr. W. H. Trentham, whose original estimate of the cost was £21,450. What the actual cost has been, is not yet known; but it was stated that the contracts were let on favourable terms, and it is not anticipated that the original estimate will be exceeded. The Corporation have, however, been put to an expense of about £3000 in order to obtain a supply of water. When the scheme was under consideration, it was suggested by a party in the town that the most desirable site for the works was the Town Mills; but this proposal was not adopted because, in the opinion of Mr. Trentham, there was not sufficient space there. The Corporation have, however, now bought the Town Mills and certain water rights, and will pump water from there to the electric lighting station. This purchase has given rise to a great deal of controversy, and was the cause of a heated discussion in the Council last week. Another matter which has caused dispute is the action of the Corporation in undertaking the supply of fittings and the wiring of consumers' premises. This has been challenged in the Law Courts, and is the subject of an action which is now awaiting trial. The Corporation start with 102 orders for installations, representing for private consumers about 4000 lamps, or two-thirds of the productive power of the station. Mr. Trentham estimates that, when the lighting is extended to the whole borough, the revenue will amount to £4238, and the Corporation will make an annual profit of £727. The Corporation contemplate an early extension of the scheme.

The Question of Depreciation.

A report was submitted to the Exeter City Council last week, by Mr. H. D. Munro, the Electrical Engineer, on the working of the

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undertaking during the past year. An increase of nearly 10 per cent. in the number of units sold was recorded, without material increase in the cost of production. In spite of additional burdens in the shape of higher rates and contributions to other departments, the net profit exceeded £1500, which was higher than that of any other year. Mr. Wreford, the Chairman of the Electric Lighting Committee, moving the adoption of the report at the City Council meeting on Wednesday, mentioned that the profit of the year before was £879, and that, after providing interest and sinking fund, they had now accumulated profits to the amount of £5000. Mr. Ross pointed out that no provision was made for depreciation; and he moved that the report be referred back, in order that the Committee might consider the question of forming a reserve fund. If proper allowance were made under this head, it would be found that last year's working produced a loss instead of a profit. If a profit were made, it should be allowed to the consumer, and not put on one side to reduce the rates. Mr. Wreford said he had no objection to the motion, but thought that, as to the question of depreciation, account should be taken of the fact that on the plant handed over by the old Electric Lighting Company, and on part of that purchased since, they only had fifteen years for repayment of the cost, and nearly half this time had expired. As to the disposal of the profits, if there was any balance when the new station was in working order, the consumers' claims should have the first consideration. Mr. Perry contended that a depreciation fund was unnecessary, seeing that they had its equivalent in the sinking fund. Mr. Roberts said it was true that they served a similar purpose; but the sinking fund alone was not enough, and a larger amount ought to be set aside. The motion to refer the matter back to the Committee was agreed to.

Protecting the Ratepayers at Caerphilly.

Among the notices given of intended applications to the Board of Trade for Electric Lighting Orders are two emanating respectively from the Caerphilly and Bedwellty District Councils. The former place has a population of 17,000 or 18,000, who inhabit an area of a very straggling character (being divided into several districts isolated from each other by ranges of mountains), and the rateable value is somewhere in the neighbourhood of £70,000. The population of Bedwellty is about 50 per cent. less than the above-named figures; but the rateable value is more than half, while the character of the district is the same. The conditions do not, therefore, seem particularly favourable for profitably carrying on schemes of electric lighting; and this fact was brought under the notice of the parties most concerned—the larger ratepayers—a short time ago by Mr. Albert R. Cawley, the General Manager of the Rhymney and Aber Valleys Gas and Water Company. In a circular-letter addressed to them, he called their attention to the fact that, according to the last published returns relating to local authorities supplying electric light, 109 out of 149 show a loss amounting in the aggregate to £148,000 per annum, which, of course, had to be made good out of the general district rates, to which the large companies have all to contribute without representation or having any voice in the expenditure. He emphasized the point that if such losses were incurred in populous and compact cities, they might be expected to arise in others less well situated, such as the two in question. He enclosed a reprint of the remarks made by Sir George Livesey at the last meeting of the South Metropolitan Gas Company, on the action of the Company in connection with the Bermondsey and Woolwich Orders last session, and their success in obtaining the insertion of a clause protecting the ratepayers against the imposition of a charge to make up the losses on the electric light undertaking. Mr. Cawley urged the importance of endeavouring to have a similar clause inserted in the two Orders affecting his district; and he invited the co-operation of the large ratepayers in a movement in this direction. The result has been the presentation to the Board of Trade of a number of objections to each Order, conspicuous among the parties raising them being the Cardiff Corporation, whose trunk water-mains pass through a portion of the Caerphilly district. It is unnecessary to enumerate the objectors. Suffice it to say that they will be formidable opponents to the promoters, unless the latter see the wisdom of yielding to the demands made. Should they do this, the ratepayers will have to thank Mr. Cawley for the protection which his prompt action will have secured for them.

Stepney's Electric Light Undertaking—Proposed Discounts.

At a recent meeting of the Stepney Borough Council, a report was presented by the Electric Lighting Committee on the subject of a suggestion made by the Consulting Electrical Engineer (Mr. Arthur Wright) some weeks ago that discounts should be allowed to large users of current. He proposed that, from the 1st ult., all consumers whose annual bill exceeds £100 in respect of any one premises should be allowed a discount of 20 per cent. on the excess only over the £100 until further notice, provided that they should have consumed and paid for at least 12 units per annum per 8-candle lamp or its equivalent demanded. He said he had worked out this discount as applied to the consumers connected on March 31, 1901, and found that eleven of the largest would benefit to the extent of about £350 in all, or a reduction in the gross revenue of about 3 per cent., which he said the Council could very well afford, in order to prevent the loss of three or four of the largest and most profitable consumers who used electricity in the daytime. The Committee agreed that discounts should be allowed on the terms suggested, but considered that 18 units should be substituted for 12. They accordingly recommended—"That to all consumers whose bills exceed £100 in respect of any one premises, a discount of 20 per cent. on the excess only over the £100 shall be allowed until further notice, provided that such consumers shall have consumed and paid for at least 18 units per annum per 8-candle power lamp or its equivalent demanded." Mr. Gordon said he regarded the proposals of the Committee as disastrous, from a financial point of view. This was the first time within his knowledge that a Committee of the Council had brought forward proposals which were either illegal or constituted an evasion of the law. They had no right

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to differentiate in the charges to the ratepayers. Look at it as they might, a discount really meant a reduction in the cost of electricity, and it was only to be allowed to large consumers. This was introducing a wrong principle from the municipal standpoint. The borough electric light installation was founded on the credit, not of the large consumers alone, but on that of every man who lived in Stepney. Alderman Harris characterized the proposal as ruinous. Mr. Musto expressed the opinion that the figures submitted by the Committee were illusory, and said he hoped the Engineer would be present at the next meeting to face the Council. Mr. Fage pointed out that two firms had threatened to discontinue using the municipal supply of current if discount were not allowed, and put up their own installations. The report was referred back to the Committee.

NORTH WARWICKSHIRE WATER ARBITRATION.

The Award.

The award in this arbitration, which was held at the Surveyors' Institution in October, and the proceedings at which were reported in the "JOURNAL" for Nov. 18 last (p. 1358), was given on Friday by the Umpire (Sir Frederick Bramwell). The arbitration, it may be remembered, was to determine the price to be paid to the North Warwickshire Water Company by the Coventry Corporation for a portion of the Company's undertaking to be acquired compulsorily. Mr. Walter Hunter was Arbitrator for the Company, and Mr. Charles Hawksley for the Corporation. The Company was formed under an Act passed in 1898, which was opposed by the Corporation, who contended that a portion of the district the Company sought to supply was really an overflow population of Coventry, and that probably before very long this area would be taken into the city. Negotiations took place between the Company and the Corporation, as a result of which a clause was inserted in the Act to the effect that if within seven years the boundaries of the city of Coventry were extended, and notice was given by the Corporation, the Company were to sell the portion of the undertaking which existed in the added area. Since the date of the Act, the district in question (Foleshill and Stoke) had been included in the county borough; and hence the clause agreed to between the parties became operative. One of the stipulations was that no allowance was to be made for the value of the works to be acquired which might accrue after the year 1910; and the arbitration was complicated by the fact that the Corporation were only purchasing works, and not the water which the Company had provided for the supply of the area in question. The respective valuations put forward in the arbitration were as follows: On behalf of the Company, Mr. Joseph Quick, £75,371; and Mr Henry Rofe, £77,463. On behalf of the Corporation, Mr. E. M. Eaton, £22,992; and Mr. G. Strachan £22,984. The Umpire has awarded the Company the sum of £39,209.

READING WATER SUPPLY.

Local Government Board Inquiry—Further Money Powers.

Application having been made by the Reading Corporation to the Local Government Board for a Provisional Order to enable them to borrow additional moneys for the purposes of their water undertaking, Colonel W. L. Coke, M.Inst.C.E., held the usual local inquiry into the matter. It was attended by the Mayor (Mr. A. H. Bull) the Chairman of the Water Committee (Alderman Hill), the Town Clerk (Mr. H. Day), the Manager of the works (Mr. A. T. Walker, Assoc.M.Inst.C.E.), and other officials. The Town Clerk stated that the population of the borough at the census of 1901 was 72,217, and the assessable value last Michaelmas £374,018. The present total capital debt of the water undertaking was £115,566 in Reading Corporation 3½ per cent. stock, and £92,512 in Corporation 3 per cent. stock; and, deducting the amounts available for redemption, totalling £29,391, there was a net debt of £183,687. The old water-works which had belonged to a Company, became vested in the Reading Local Board of Health by the Act of 1868, and the Corporation had extended and improved their works previous to the Provisional Order of 1899, which authorized the present extensions at Tilehurst, &c. By the Act of 1887, the water area was extended to the boundaries of the enlarged borough; and since then the supply had been taken to Caversham. The area of the enlarged borough was 5878 acres, and that of Caversham about 2000 acres. The population in both areas had rapidly increased within the last twenty years, and appeared likely to grow still more quickly in the future; so that there was great necessity for providing ample water, properly filtered. The estimate as to the population of Reading to June, 1903, made for sanitary purposes, was 75,277; so that the total number now supplied with water could not be less than between 80,000 and 85,000. The Order of 1899 extended the borrowing powers of the Corporation by £50,000; but the plans for the reservoir, &c., were so altered by the requirements of the Local Government Board that the reservoir alone had cost, including an increase in the price of material and labour, £27,318 up to the present time; and a further sum of £1073 was required to complete it. This was against the original estimate of £17,420; so that the total excess cost on the reservoir was £10,971. Other important work, including covering the Bath Road reservoir and extensions of mains originally intended to be included in the £50,000, had to be left undone; and it was intended to provide for them by the present proposed increase of borrowing powers. The Town Clerk put in detailed statements, which showed that this additional expenditure would be covered by the sum of £20,000 for which borrowing powers were now sought. Mr. Walker gave particulars as to the works.

London Water Board.—At the last meeting of the Middlesex County Council Alderman Huggett, of Tottenham, was elected to represent them on the above-named Board.

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SALTLEY WORKS, BIRMINGHAM	2,000,000
COLCHESTER	300,000
BIRKENHEAD.	2,250,000
SWINDON (New Swindon Gas Co.)	120,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA.	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract Remodelled)	2,000,000
BELLEVILLE.	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000

	Cubic Feet Daily.
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDE (HOLLAND)	150,000
BUENOS AYRES (RIVER PLATE CO.)	700,000
BURNLEY	1,500,000
KINGSTON-ON-THAMES	1,750,000
ACCRINGTON	500,000
TONBRIDGE	300,000
STRETFORD	500,000
OLDBURY	300,000
TODMORDEN	500,000
SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
YORK (Second Contract)	750,000
ROCHESTER (Second Contract)	500,000
NEWPORT (MON.)	250,000
TOKIO, JAPAN	1,000,000
PERNAMBUCO (Brazil)	125,000
MALTON	150,000
DULUTH, MINN. (Second Contract)	300,000
BROCKVILLE (ONT.)	250,000

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WATER SUPPLY OF CAPE TOWN.

A report has been presented to the Cape Town Borough Council, by Mr. T. Stewart, M.Inst.C.E., on the subject of excess expenditure incurred upon additional reservoir works on Table Mountain. We learn from some particulars therefrom given in "Engineering" that the reservoir in question was originally estimated to cost £112,000, but the outlay upon it will now be carried to at least £192,000. The chief causes of the excess have been the extra depth to which the foundations for the dam have had to be carried, a deficiency in the supply of native labour, and extra wages paid in consequence, and an increase in the price of certain materials required for the works. The principal cause of the excess has undoubtedly been the unsatisfactory nature of the foundations met with at the depths originally proposed for the base of the dam. Except at a few points, it has been found necessary to excavate considerably deeper. The average depth to which the dam was originally intended to be carried, and on which the estimate of £112,000 was formed, was 8 feet, which was practically the same average depth as that found necessary for the Woodhead dam, which is only 400 yards away, and which is in exactly the same class of rock. But in excavating the trench, it was found necessary, in order to make certain that the dam should rest upon water-tight rock, to excavate to much greater depths. On the left side the trench was carried to a depth of about 42 feet below the surface of the ground for the length of about 50 feet. The hole was filled with masonry and concrete a long time ago, and since then the wall above it has been completed to its full height. The portion of the trench to the right, which has had to be carried much deeper than was originally anticipated, is about 250 feet long at the surface, 80 feet long at a depth of 40 feet, and 60 feet long at the bottom, which is about 65 feet below the surface of the ground. This is the portion of the trench which has given the most trouble. But the difficulties met with have now been nearly all overcome, and a reliable and water-tight foundation has been secured, except for a short distance, where a fissure of curiously broken rock is still being dealt with. The deficiency in the supply of native labour is illustrated by the fact that the average number of natives employed daily in 1900 was 232; in 1901, 121; and for the first nine months of 1902, 159. The average number required per day to keep the works going at full speed was about 250. Since September, however, the supply has been ample.

Gas Workers in the Provinces.—According to further published returns of the last Census, the number of persons enumerated as engaged in gas-works service in the administrative counties of Hertford, Dorset, Oxford, Cambridge, and Buckingham, totalled 235, 248, 171, 111, and 148 respectively.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Edinburgh and Leith Gas Commissioners held their monthly meeting on Monday last. The Works Committee reported that they had instructed the Engineer (Mr. W. R. Herring) to consider and report as to the contemplated extension of the gas supply to Gilmerton. The same Commissioners reported that there were now only eight foreigners employed in the Granton works; they had had before them plans, prepared by the Engineer, for the erection of workshops and dwelling-houses in Leith, and had ordered an estimate of the cost to be drawn up; that the Engineer having reported to them that there was inconvenience at Granton on account of the short supply of water, they had instructed him to report as to the expense of sinking a well in their own ground; and that it was proposed to formally open the Granton works about the middle of next month—the wife of Lord Provost Steel to be asked to perform the ceremony.

After some conversation with regard to the illuminating power of the gas, Mr. D. Purves, the Convener of the Works Committee, reported that the Committee had further considered the pensions to be allowed to the men whose services had been dispensed with at Leith. They had increased the allowances to some of them; but the whole proposals would be printed and circulated among the Commissioners, who would have an opportunity of judging for themselves. The services of Mr. Walker, the Station Manager at Leith, having been interfered with by the closing of the works, the Committee recommended that he be granted £100 a year, during the pleasure of the Commissioners, for a period of not more than five years. Mr. Purves moved the adoption of the recommendation. It was also proposed to limit the allowance to three years; but, on a division, the recommendation of the Committee was adopted.

I have always admired the way in which the Corporation of Aberdeen manage their gas undertaking. In equipment they are invariably ahead of requirements; and when an extension is needed, it is agreed to without imposing any of the vexatious delays which are common, or resorting to the cutting-down process, with which we are likewise acquainted. There was such an instance this week, when the Assistant-Manager reported that, in consequence of the increasing demand for gas, it had been felt to be necessary to largely extend the purifying plant in the works. The last extension took place in 1899. Plans of buildings and plant, which are estimated to cost about £7000, were submitted and approved of.

The Perth Corporation have, as stated last week, been busy over the matter of the alleged increase in the gas bills of a number of consumers. On Monday, the Gas Committee had before them a statement on the subject, which had been prepared by Mr. Cuthbert, the Convener of the Committee, and Mr. C. Lindsay, the Gas Treasurer, and also a report made upon it by Mr. W. B. M'Lusky, the Engineer and

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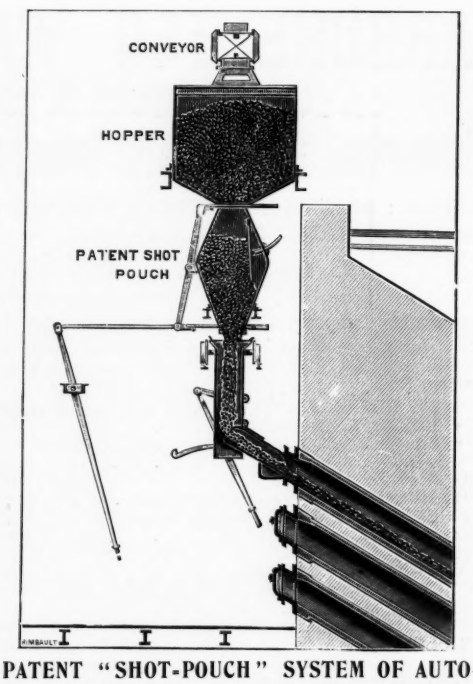

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Manager. The former document went into matters in detail, and concluded with the statement that, on a consideration of all the circumstances, they suggested to the Gas Committee the propriety of leaving it to them (the Convener and the Treasurer) to meet with the parties and endeavour to make a settlement, by way of compromise, if necessary. They strongly urged the Committee to get the matter out of the way, as for a time it had affected the consumption of gas. Mr. M'Lusky's report was as follows :—

The Convener, Mr. Lindsay, and I have discussed this question together on more than one occasion since the matter was remitted to us; and I have carefully considered the 29 letters which were written to Mr. Lindsay in reply to the circulars issued by him. A number of the letters are from consumers whose complaints were covered by my report of April 21 last, and whose cases were subsequently dealt with by Mr. Newbigging. I ask you to consider the fact that Mr. Newbigging's report has been received by you, and that, as I entirely agree with and accept the advice given by that eminent authority, any information which I might lay before you would consist simply of evidence collected since the date of that report, and would consist chiefly of examples proving the statements made in the report.

I beg that you will not ask me to go into details. Such a course undoubtedly would break down the case of some consumers and involve third parties; but evidence of this kind is not required to support the more general and less irritating statements which I have laid before you. In going over the 29 letters, I observe that some of the writers quote figures from the accounts rendered to them since the end of the last winter term as evidence of the economy in gas consumed on their premises in the spring, summer, and autumn, and that others complain particularly of the increased quantity of gas consumed by them in these latter periods. There is no doubt that a number of our consumers have consumed more gas than ever they intended to use, or required to use; and while this waste has been going on in one house, results have been attained in another house which have appealed to the gas consumer as an example of gas economy. There is a great need of more strict supervision than at present of consumers' fittings and burners.

It is here that waste occurs; and it is this hourly waste, or waste arising from use of gas over an undue (and in many cases unknown to the householder) number of hours, which causes such gross irregularity in the consumers' accounts. We ought to help consumers more by instructing them how to prevent waste; but we cannot, in fairness to our consumers in general, take money which they have paid, and hand it over to another consumer in the shape of rebate. All consumers must be charged "gas as per meter index," through meters stamped by authority of the Board of Trade; and any discount given to one consumer must be given to all proportionately.

The Committee had a long discussion, and agreed, by a majority, to recommend that the Convener and the Treasurer should not get powers to settle the amounts. This result Mr. Cuthbert said he looked upon as a vote of no confidence in him. The Council met in Committee on Thursday, and considered the subject. It took them an hour-and-a-half to arrive at a resolution, which was again by a majority, and was to the effect that the Gas Treasurer be instructed to recover the accounts in the usual way, without any rebate being allowed. That is the only right conclusion in the matter.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 31.

Sulphate of Ammonia.

There has been good demand at all points and a further advance in values, Scotland still leading the way; the closing quotations being £12 11s. 3d. per ton f.o.b. Hull and Liverpool, and £12 12s. 6d. per ton f.o.b. Leith. Most of the buying has been for covering contracts, and it has to be noted that quotations abroad are below the parity of current prices f.o.b. United Kingdom ports. There has been renewed activity for forward delivery, £12 10s. per ton, Beckton terms, London, having been paid for February-March, and £12 12s. 6d. per ton being subsequently demanded. For July-December delivery, £12 5s. per ton, ordinary terms, f.o.b. Leith, has been paid, while for spring months makers now ask £12 15s.

Nitrate of Soda.

There has been no corresponding movement in this article, the market, though steady, being without improvement. Spot prices remain at 9s. 1½d. and 9s. 3d. per cwt. for ordinary and refined qualities respectively.

LONDON, *Jan.* 31.

Tar Products.

The markets remain quiet; and there is no special business to report. The position of pitch is unchanged; but prices do not show any signs of advancing, and there is certainly a falling off in the demand for prompt shipment. In carbolic, there is an improved demand for crystals; and most of the large makers now quote 5⅝d. for 34-35's. and 5¾d. for 39-40's. In 60's crude, a large business has been done at 1s. 7d. for prompt; but consumers do not care about purchasing forward. In benzol, the market is rather quiet, and there is more 90 per cent. offering; but as against this the consumption for enriching gas is increasing. Business is reported in 50-90 per cent. at 8¼d. prompt; but an offer of 8½d. was declined for July-December. The market for creosote is easier, especially in the North, where there is more offering for prompt delivery. There is a little business in solvent; but only at low prices, and for home consumption. In anthracene and toluol, there is really nothing doing.

The average values during the week were: Tar, 22s. 6d. to 27s. Pitch, London, 58s. 6d. to 60s.; east coast, 56s. to 57s. 6d.; west coast, 55s. to 56s. Benzol, 90 per cent., 9½d. to 10d.; 50-90 per cent., 8d. to 8¼d. Toluol, 7d. to 7½d. Crude naphtha, 3¼d.; solvent naphtha, 8½d. to 9½d.; heavy naphtha, 9d. to 10d. Creosote, London, 1⅛d.; North, 1½d. to 1½d. Heavy oils, 2d. to 2¼d. Carbolic acid, 60 per cent., 1s. 6½d. to 1s. 7d. Naphthalene, 35s. to 55s.; salts, 25s. to 27s. 6d. Anthracene, "A" quality, 1½d. to 1¾d.; "B" quality, 1d. nominal.

Sulphate of Ammonia.

The market continues firm; and there is a good inquiry for both prompt and forward delivery. The Gaslight and Coke Company now

THE

MAXIM PATENT CARBURETTOR

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PREVENTS NAPHTHALENE DEPOSITS.

OVER **100** MAXIM PATENT CARBURETTORS HAVE NOW BEEN FIXED.

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MORE GAS & SALEABLE COKE PER TON of COAL CARBONIZED is PRODUCED; SAVING CAPITAL, LABOUR, FUEL, WEAR & TEAR, &c.

THE ENRICHMENT IS INSTANTANEOUS AND PERMANENT.

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.

For Prices and full Particulars, apply to

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

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quote £12 12s. 6d. per ton for February-March; while they are reported to have arranged business at £12 6s. 3d. for April-September. Another London Gas Company have sold at £12 12s. 6d. on their own special terms for February shipment. In Hull, sales were made at £12 8s. 9d. prompt; and in one instance £12 10s. was paid for February shipment. In Leith, makers are reported to have declined £12 10s. for prompt, and are asking £12 11s. 3d. to £12 12s. 6d. for February shipment. A strong demand is reported to exist at this port for forward delivery; but makers are not at all anxious to sell. In Liverpool, prices do not show much signs of advancing, and business has been done at as low as £12 7s. 6d.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Although the market shows some tendency towards weakness in the better qualities of round coal suitable for house-fire purposes, generally as regards other descriptions of fuel a strong position is maintained. The continued mildness of the season is checking requirements for house-fire consumption, and collieries in some cases are not being kept on full time; and there is, again, an accumulation of surplus output under load on many of the pit sidings. Quoted rates remain unchanged; but in the open market there were sellers prepared with slight temporary concessions to effect clearance sales. Common round coals are in fairly good inland request for iron making, steam, and general manufacturing purposes; and there would seem to be a probability that in this class of fuel prices may be maintained on a better basis for the next twelve months than seemed probable a short time back. This will have, indirectly, its effect upon quotations for gas-making coal. The very low-cut quotations have mostly disappeared from the market, and the common sorts of steam and forge coals could scarcely now be bought under 8s. 3d. to 8s. 6d. per ton; while better qualities range from 8s. 9d. to 9s. 3d. and 9s. 6d. per ton at the pit-mouth. Engine fuel is in fairly brisk request, and supplies not at all plentiful—some collieries being short to meet the requirements of customers, owing to the lessened quantity of house-fire coal that has been screened recently. Pit prices have been firmly maintained at late rates; best slack averaging 6s. 6d. to 7s. per ton, medium sorts 5s. 6d. to 6s., and common slack 4s. 3d. to 4s. 9d. at the pit-mouth. The shipping trade continues moderately active, though there is perhaps not the inquiry for slack that has been coming upon the market of late. Ordinary qualities of steam coal average 11s. per ton delivered at the ports on the Mersey, with slack quoted from 6s. up to 7s.

Northern Coal Trade.

The demand for coal is less pressing than it was; but the collieries are generally fully working, unless where steamers are delayed by weather. Best Northumbrian steam coals are quiet at 11s. 3d. per ton f.o.b., second class steams are about 10s. 6d., and steam smalls are 5s. 6d. to 5s. 9d. In gas coals, there is a steady delivery on the large contracts; but there will now be reduced quantities taken, so that more of this kind of coal may be put on the market. The price that is quoted for occasional cargoes is at the rate of 9s. 9d. to 10s. per ton f.o.b.; but the contracts seem to be based on about 1s. per ton below that rate, according to the time that the delivery extends over. Gas coke is steady at 13s. 6d. to 14s. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

No change can be recorded this week. There is still a good forward demand, both home and foreign, and the output is at present being quite taken up. The prices quoted are: Main 9s. to 9s. 3d. per ton f.o.b. Glasgow, ell 9s. 9d. to 10s. 9d., and splint 10s. 9d. to 11s. The shipments for the week amounted to 213,075 tons—an increase of 47,678 tons upon the preceding week, and of 33,107 tons upon the corresponding week of last year. For the year to date, the total shipments have been 559,407 tons—a decrease of 8562 tons upon the same period of last year.

Metropolitan Gas Company of Melbourne.—The profits of this Company for the six months to the 31st of December last amounted to £50,500. A dividend of 4s. 6d. per share has been declared for the half year; a sum of £10,000 has been added to the reserve fund; and a balance of £11,500 carried forward.

Chapel-en-le-Frith Water Supply.—A scheme for the extension of the Bamford Water-Works for the Chapel-en-le-Frith Rural District Council is to be proceeded with at once, and contracts for material are pending. The idea is to construct, at a cost of £1660, an additional reservoir with a capacity of 100,000 gallons.

The Proposed New Gas-Works for Birmingham.—The small township of Erdington, on the borders of Birmingham, has lately been exercised over the gas-works question. When the Birmingham Corporation first announced their intention to erect works within the Erdington area, a number of the leading residents declared that its beautiful rurality should not be spoiled and pure atmosphere contaminated by them. The opposition was then very strong; but now that the time has come to give practical expression to it by formally resisting the Corporation's Bill, there are signs that the malcontents do not entirely represent the ratepayers. Two of the five wards have held meetings at which resolutions have been passed strongly protesting against the District Council going to the expense of a parliamentary resistance. The Council have decided, by special resolution, in spite of a strong minority, to persist in their opposition; but this decision has to be approved at a town's meeting to be shortly held. The proposal will be strongly resisted; and the pacific section, who are disinclined for a tilt against their big neighbour, will, if the resolution is carried, demand a poll. They assert that 95 per cent. of the residents cannot possibly sustain the slightest inconvenience; while the introduction of this large industry will increase the rateable value of the district.

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Valves and other internal parts are accessible upon the removal of the Side Plate of the Valve-Chamber.

Occupies very little Space. The Flange diameter is about the greatest width.

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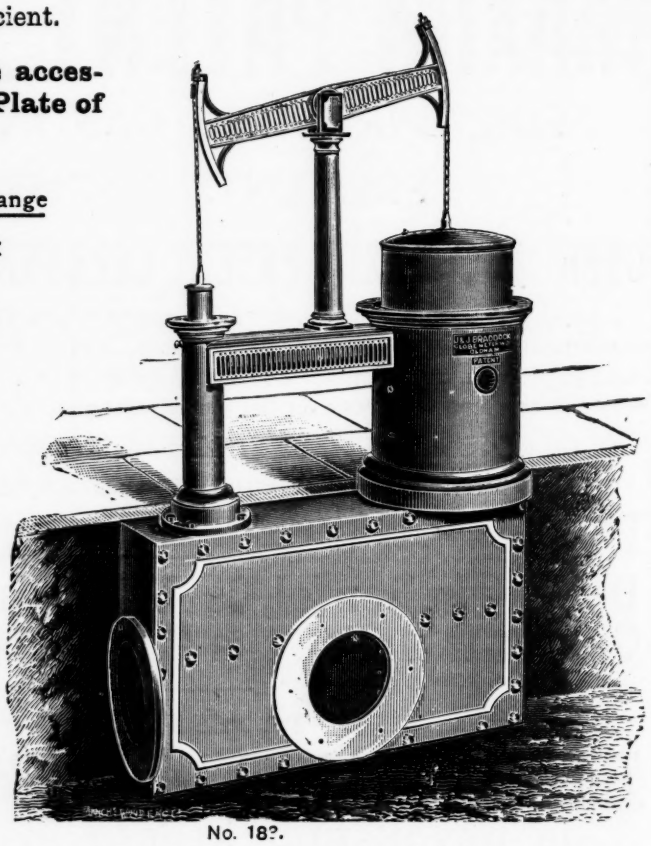

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Brentford Gas Company.—The balance at the credit of the net revenue account of this Company, subject to audit, will enable the Directors to recommend dividends for the past half year at the rate of 5, 12, and 9 per cent. per annum, carrying forward £49,401.

Projected Extension of the Draycott Gas-Works.—The Directors of the Draycott Gas Company discussed at a recent meeting the question of making further extensions to their carbonizing and other plant, owing to the rapid increase in the consumption, which has gone up to an annual output of 16 million cubic feet. It was confidently assumed that the undertaking would, in the immediate future, grow as rapidly as it has done in the past five years.

French General and Continental Gas Company.—The sale of gas from the various works of this Company in the past financial year amounted to close upon 500 million cubic feet; being about 22½ millions in excess of the preceding twelve months. The profits realized were, as a rule, considerably less than before, owing to the fact that in 1901 the works which were being carried on under the old contracts had their coals at a cheap rate, and a good price was realized for coke; whereas the reverse was the case last year.

Gas Supply Rights at Shipley.—The minutes submitted by the Gas and Electricity Committee to the last meeting of the Shipley Urban District Council showed that the Committee had had before them a report to the effect that Sir Titus Salt, Bart, Sons, and Co., Limited, claimed the right to prevent the Council laying a gas-main in John Street, off Saltaire Road. The Clerk was directed to ask for an explanation, and to obtain Counsel's opinion on the claim of the firm, which was considered an infringement of the rights of the Council as to gas supply. Mr. Lindley, in proposing the adoption of the minutes, said that it would be better not to discuss the matter until the opinion of Counsel was received. When the decision was obtained, it would be communicated to the Council; and the question could then be gone into fully.

Further Inclined Retort Installation at Leeds.—The "Yorkshire Post" states that, owing to the success which has attended the use of inclined retorts at the Meadow Lane and York Street gas-works at Leeds, the Gas Committee have decided to recommend the Corporation to approve of a similar installation at New Wortley. The estimated cost is about £32,000. Subject to the sanction of the City Council to-morrow, the Committee have accepted the tender of Messrs. William Irwin and Co. for the erection of the building, and that of Messrs. Graham, Morton, and Co. for the installation of 22 beds of inclined retorts. With the confirmation of the Committee's action, two very old houses, fitted with horizontal retorts without machinery, and practically obsolete, will, during the summer months, be demolished; and the old-fashioned and slow method of hand-stoking at the New Wortley works will be entirely done away with.

Municipal Trading Brings Increased Rates.—Speaking at the meeting of the Great Eastern Railway Company last Wednesday, the Chairman (Lord Claud Hamilton) referred to the growth of the rates and taxes during the past few years. In 1891, the Company paid £136,500; in 1901, £270,300—an increase of £133,800, or 98 per cent. Taking the two districts celebrated for their municipal "enterprise," he showed the consequent effect of this policy upon the ratepayers. In the parish of Walthamstow, in 1891 the railway's assessment was £6500; in 1901 it was £12,600, or an increase of 94 per cent. The rates and taxes they paid in Walthamstow in 1891 were £1540; in 1901 they were £3746, or an increase of 143 per cent. Taking the more celebrated borough of West Ham, in 1891 their assessment was £33,832; in 1901 it was £96,882. They paid in rates in West Ham in 1891 £7636, and in 1901 £35,679, or an increase of 369 per cent. The statement evoked cries of "Shame." His Lordship added that these figures needed no comment from him.

Peterborough Water Supply.—Mr. J. C. Pottinger, M.Inst.C.E., one of the Inspectors of the Local Government Board, held a public inquiry at Peterborough, on the 30th ult., into an application by the Peterborough Town Council for a loan to enable them to purchase land for obtaining an additional supply of water. The Borough Engineer explained that Peterborough, with 35,000 inhabitants, was dependent for its water on a single 18-inch main, which conveyed the supply a distance of 14 miles. The daily consumption was 1,349,447 gallons. The proposed site was within six miles of the borough. Three trial tube-wells, sunk on the site, yielded 1,161,090 gallons per day. The water rose to a height of 26 feet from the surface of the ground; and the supply was tapped at an average of 140 feet. The water had been pronounced of remarkable purity, and it blended well with the existing supply. It was found in the limestone rock, in the oolitic formation. Formal opposition to the scheme was entered on behalf of the District Council in whose area the site is situated.

Sales of Shares.—At the Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards placed a new issue of £10 "F" preference shares (5 per cent.) in the Aldershot Gas and Water Company at prices ranging from £11 5s. to £11 12s. 6d. each; and a new issue of "A" £10 shares in the Tendring Hundred Water Company (maximum dividend 8 per cent., but last paid 4½ per cent.) at par. It may be remembered that a few weeks ago the Tottenham and Edmonton Gas Company offered for sale by tender £7500 of 4 per cent. debenture stock. In response to the invitation, 44 tenders, amounting to £14,970, were received, and 22 allotments made. The offers ranged from £102 up to £106 per cent.; and the amount required was accepted at from £102 10s. up to the highest figure—the average premium obtained being £3 2s. 2d. per £100 of stock. At Leeds, last Tuesday, Messrs. Hollis and Webb sold some new 7 per cent. stock in the Pudsey Gas Company at £212 per cent. A small amount of 7 per cent. "B" stock in the Drighlington and Gildersome Gas Company realized £158 per cent.; some original 10 per cent. stock in the same Company, from £230 to £233 per cent.; and 28 new shares (£3 paid), from £5 13s. 6d. to £5 15s. per share. A few preference shares in the Crossgates, Halton, and Seacroft Gas Company sold at £11 15s. each; eleven shares in the Aberford Gas Company, at £2 8s. 6d. each; and £1000 of Gaslight and Coke Company ordinary stock, at £89 per cent.

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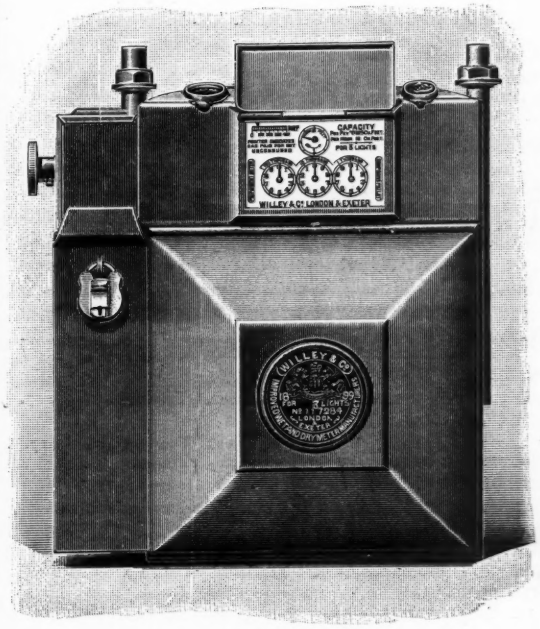

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Explosion at the Bolton Gas-Works.—A serious explosion occurred at the Lum Street gas-works of the Bolton Corporation last Saturday. The engine-house was wrecked and a portion of the works fired. The damage is estimated at £1000.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

SITUATIONS VACANT.

ASSISTANT FOREMAN. No. 3984.
DRAUGHTSMAN (Architectural). Coventry Gas-Works.
FITTER, &c. Grantham Gas Company.
GENERAL CLERK. No. 3985.
GENERAL FOREMAN. Londonderry Gas-Works.
JUNIOR CLERK. Guildford Gas-Works.
MECHANIC AND SMITH. No. 3983.
STOKERS (Two). Clay Cross Gas-Works.
WATER MANAGER. Airdrie and Coatbridge Water Trustees. Feb. 14.
WORKING MANAGER. St. Paul's Road, Preston.

SITUATION WANTED.

ELECTRICAL AND MECHANICAL ENGINEER. No. 3986.

PUPIL IN GAS-WORKS.

GOODSON. Heckmondwike.

PLANT, &c. (Second-Hand), FOR SALE.

CONDENSER. Redditch Gas-Works.
EXHAUSTER AND ENGINE (combined). No. 3987.
PURIFIERS AND CONNECTIONS. Wright, London.
PURIFIERS, WASHER-SCRUBBER, &c. While and Son, London.
RETORT IRONWORK. Aberdare Gas Company. Tenders by Feb. 10.
VARIOUS GAS PLANT. Firth Blakeley, Dewsbury.

PLANT, &c., WANTED.

GAS BRACKETS, CHANDELIERS, &c. Dubray, Brussels.
METERS (DISUSED), BRASS, COPPER, LEAD ASHES, &c. Smith, Bradford.

MEETINGS OF COMPANIES.

COLNEY HATCH GAS COMPANY. Feb. 19.
COMMERCIAL GAS COMPANY. Feb. 19.
CRYSTAL PALACE GAS COMPANY. Feb. 13.
TOTTENHAM AND EDMONTON GAS COMPANY. Feb. 21.

SALES OF STOCKS AND SHARES.

GAS METER COMPANY. Feb. 17.
GOSPORT WATER COMPANY. Feb. 17.
HARROW AND STANMORE GAS COMPANY. Feb. 17.
ILFORD GAS COMPANY. Feb. 17.
LAMBETH WATER COMPANY. Feb. 16.
LOWESTOFT WATER AND GAS COMPANY. Feb. 24.
SOUTH ESSEX WATER COMPANY. Feb. 17.
SOUTH WEST SUBURBAN WATER COMPANY. Feb. 24.
SUNDERLAND AND SOUTH SHIELDS WATER COMPANY. Feb. 19.
TOTTENHAM AND EDMONTON GAS COMPANY. Feb. 28.
WEST HAM GAS COMPANY. Feb. 18.

TENDERS FOR

AMMONIACAL LIQUOR.

BRISTOL GAS COMPANY. Tenders by Feb. 24.

BRASS COCKS AND FITTINGS.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 17.
NELSON GAS DEPARTMENT. Tenders by Feb. 18.

COOKERS.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 17.

FIRE CLAY GOODS.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 17.
BOLTON GAS DEPARTMENT. Tenders by Feb. 12.

GASHOLDERS.

COVENTRY GAS DEPARTMENT (Two). Tenders by Feb. 14.
HENLEY-IN-ARDEN GAS COMPANY. Tenders by Feb. 11.

GAS-WORKS (Complete).

SILSDEN DISTRICT COUNCIL. Tenders by Feb. 23.

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NELSON GAS DEPARTMENT. Tenders by Feb. 18.

LIME.

NELSON GAS DEPARTMENT. Tenders by Feb. 18.

LIVESEY WASHER.

STOURBRIDGE GAS DEPARTMENT. Tenders by Feb. 10.

METERS.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 17.

PIPES AND CONNECTIONS, &c.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 17.
NELSON GAS DEPARTMENT. Tenders by Feb. 18.
STOCKTON-ON-TEES GAS DEPARTMENT. Tenders by Feb. 24.

RETORTS.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 17.
BOLTON GAS DEPARTMENT. Tenders by Feb. 12.

SULPHURIC ACID.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 17.
NELSON GAS DEPARTMENT. Tenders by Feb. 18,

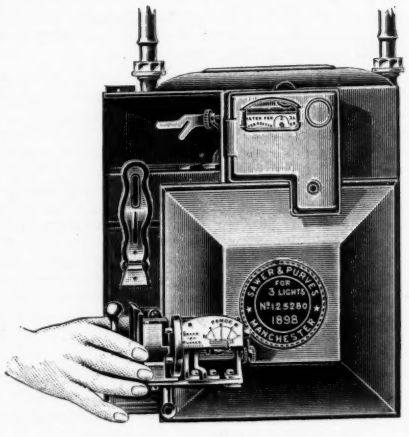
TANK FOR GASHOLDER.

HENLEY-IN-ARDEN GAS COMPANY. Tenders by Feb. 11.

TAR.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 17.
ISLE OF THANET GAS COMPANY. Tenders by Feb. 12.
NELSON GAS DEPARTMENT. Tenders by Feb. 18.

THE POSITIVE PREPAYMENT



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PRE-EMINENT.

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MANCHESTER.

Coal-Stack Fires at Huddersfield.—On the presentation of the minutes of the Gas Committee for adoption at the last meeting of the Huddersfield County Borough Council, Mr. Mellor asked for some explanation of the coal-stack fires which occurred at the gas-works. He wished to know why they happened so frequently. Alderman Jessop said this was not the first time that they had had a coal-stack fire, and he was sorry to say that it would not be the last, as these were little matters which would occur in making gas. They had tried means to prevent the stacks firing, but had not succeeded in discovering a remedy. These fires occurred in all gas-works, whether belonging to private companies or to corporations. He hoped that the public would not be at all alarmed at anything which was happening at the gas-works at the present time.

Opening London Streets.—At a recent meeting of the Westminster City Council, the Works Committee recommended, and it was resolved, "that a communication be addressed to His Majesty's Government, suggesting that the Royal Commission about to be appointed to inquire into the congestion of traffic in the streets of London be directed to receive evidence and report upon the obstruction caused by the breaking up and use of the streets by companies and other undertakers under statutory powers to lay pipes, wires, &c., and execute works over, under, across, and along the streets; and also as to the advantage and practicability of requiring such pipes, wires, works, &c., to be placed in subways under the streets.

Conservation of Water in the East Riding.—The inhabitants of the East Riding are displaying considerable anxiety with regard to their water supply, owing to the fact that Hull will shortly be requiring 500,000 gallons more per day, all of which will be taken from the district. It is said that already many village communities are often without water, in consequence of the demand which Hull makes upon the resources of the Wolds. Expression was given to this feeling of alarm at the last meeting of the East Riding County Council, when it was agreed that the Sanitary Committee should be instructed to confer with the District Councils, with the view of united action being taken.

Lincoln Water-Works Extensions.—The Lincoln Corporation having applied for sanction to borrow £10,000 for water-works extensions, Mr. J. C. Pottinger, on behalf of the Local Government Board, last Wednesday held an inquiry into the matter. The amount was originally divided up as follows: Land, £1796; two filter-beds, with pipe connections, £2800; new pumping-engine £2646; two boilers, economizers, and superheater, £1950; alterations to buildings and pumping-engine, £600; fencing, £171; and contingencies, £37. The economizers and superheater were, however, being dispensed with; and this reduced the amount required to £9550. The quantity of water necessary last week was 1,862,000 gallons per day; and the existing filtering-beds were altogether inadequate for such a demand. The present pumping power is 1,800,000 gallons per day; but the new engines will bring the total pumping power to 3,800,000 gallons.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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For all Ammonia Joints.

GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

IT is worth your while to buy direct. THE RELIANCE LUBRICATING OIL COMPANY 19 and 20, Water Lane, Great Tower Street, London, E.C., handle all kinds of Lubricating Oils, for Engines, Cylinders, Dynamos, Spindles, &c., Burning Oils, Solar Distillates, Carburetting Oils, and Spirits for Gas Making; Motor Oils, Fuel Oils, Animal, Fish, and Vegetable Oils, &c., for all purposes. Write for our "Trade Mark" Inkstand, sent free to customers. Non-customers, 2s. 6d. each. RELIANCE LUBRICATING OIL COMPANY, London, Glasgow, Newcastle-on-Tyne, &c. Established 1858. Telegraphic Address: "Subastral," London; A.B.C. Code used. Telephone No.: Avenue 5891.

SULPHURIC ACID for Sale.

BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PATENTS AND TRADE MARKS PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 248 Holborn.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

DUTCH OXIDE OF IRON.

EERSTE Hollandsche Yzererts Maaty (First Dutch Bog Ore Company, Ltd.), ROTTERDAM.

General Manager for England and Wales)—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.

London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.

General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are pre- pared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.

SURREY ENGINEERING WORKS, BLACKFRIARS ROAD, LONDON, S.E.

Telephone: 1693 HOP. Telegrams: "LUMINOSITY."

SULPHATE OF AMMONIA SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.

For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."

Largest Practice and most Up-to-Date Works in Britain.

JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

GUILDFORD GASLIGHT AND COKE COMPANY.

WANTED, a Junior Clerk. One with a knowledge of Gas Office Routine preferred.

Apply, by letter in first instance, stating Age, Experience, and Salary required, to WILLIAM TITLEY, Secretary, Gas Offices, Guildford.

Gas Offices, Guildford,
Jan. 27, 1903.

COAL GAS TAR wanted.

Gas Managers in Gloucester, Somerset, Worcester, Devon, Wilts, Hereford, Monmouth, and Glamorgan PLEASE NOTE. BEST PRICE offered either on Fixed or Sliding-Scale Basis.

State Quantity to offer for Prompt and Forward Delivery.

The SHARPNESS CHEMICAL COMPANY, Tar Distillers, Sharpness Docks, GLOS.

OXIDE OF IRON.

FIRE CEMENT, PAINT, GAS COAL.

BALE & CHURCH, 5, CROOKED LANE, LONDON, E.C.

MOTOR CARS.

MOTOR CARS for Pleasure or Business.

MOTOR VANS for Coin Collecting.
MOTOR TIP LORRIES, and TAR or OIL WAGGONS.

LAURENCE BELL, Gas and Motor Engineer, INNERLEITHEN and PEEBLES.

DRAUGHTSMAN, with considerable experience in the design and construction of complete Gas-Works, desires ENGAGEMENT.

Address "M. M.," care of Street's, 30, CORNHILL, E.C.

MECHANIC and Smith wanted, at once. Permanent Situation to good man (Birmingham District).

Apply, by letter, stating all Particulars, to No. 3983, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

HECKMONDWIKE GAS COMPANY.

MR. A. F. GOODSON, Engineer and Sec- retary to the above COMPANY, has a vacancy for a PUPIL. A Premium will be required.

Full details furnished on application.

These are modern Works, and fitted with up-to-date Machinery.

Please apply as above.

WANTED, an Intelligent Working MANAGER, able to take the entire Management as well as Secretary's duties, for a small Gas-Works.

Applicants must state Age, Experience, and Wages required, along with two recent Testimonials. House, Gas, and Coal free.

Applicants to address 275, St. Paul's Road, PRESTON, endorsed "Gas Manager."

WATER-WORKS MANAGER.

THE Airdrie, Coatbridge, and District WATER TRUSTEES who, as at 31st May next, take over the Undertaking of the Airdrie and Coatbridge Water Company, require a thoroughly qualified MANAGER. A practical knowledge of the Construction and Maintenance of Water-Works essential.

Salary £300 per annum.

Applications, with twelve *copies* of Testimonials, and marked "Water-Works Manager," to be lodged with JOHN J. M'MURDO, Solicitor, AIRDRIE, on or before the 14th of February.

CARBIDE AND ELECTRO-CHEMICAL MANUFACTURES.

ELECTRICAL and Mechanical Engineer requires APPOINTMENT. 28 years' experience in Designing and Erection of Electric Light, Power, Smelting, and Carbide Plants. Last three years Designing and Erecting Large Gas-Engine Power Plant. Electric Furnaces, full equipment for production of Carbide and utilizing Waste Gases. After Management.
Address No. 3986, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Two Gas Stokers.
Apply, stating Wages required, to Mr. J. S. LUCKING, Gas Manager, CLAY CROSS.

WANTED, at once, by a Suburban Gas Company, a GENERAL CLERK (about 25 years of age), used to the work of a Gas Company's Office.
Apply, by letter, stating Age, Experience, and Salary required, to No. 3985, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a Provincial Gas Company, a DEPARTMENTAL ASSISTANT FOREMAN. Practical Experience of Main and Service Laying essential; also knowledge of Fixing Meters, &c. Highest Character required. To a suitable Man, this is a good opening.
Applications, stating Age, Experience, Wages, References, &c., to No. 3984, **care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.**

THE Grantham Gas Company require the services of an ENERGETIC MAN, well up in all kinds of Indoor Fitting. Must be accustomed to fixing and maintaining Incandescent Burners. One with a practical knowledge of Electric Lighting preferred.
Applications, giving Age, References, and Wages required, to reach me on or before Wednesday, Feb. 11.
R. G. SHADBOLT,
Manager, &c.

THE Coventry Corporation Gas Committee require the Services of an experienced ARCHITECTURAL DRAUGHTSMAN, well up in Plain Building Construction. Must be able to prepare Specifications and take out Quantities. One with knowledge of Modern Gas-Works Design preferred.
Apply, to the undersigned, stating Experience and Salary required.
FLETCHER W. STEVENSON,
Engineer and General Manager.
Gas-Works, Coventry,
Jan. 27, 1903.

LONDONDERRY GASLIGHT COMPANY.

GENERAL FOREMAN.

WANTED, by the above Company, a GENERAL FOREMAN, who must be used to work in connection with Inclined Retorts, Elevating and Conveying Machinery, Carburetted Water Gas, the Manufacture of Sulphate of Ammonia, &c.
He must be a thoroughly practical man, sober, and thoroughly capable of taking entire charge of the Works in the absence of the Manager.
To live on the Works—House, Gas, and Coal provided.
Apply, with recent Testimonials, stating Age, Wages expected, and full Particulars, to
R. J. SKINNER,
Manager.
Gas-Works, Lecky Road,
Londonderry, Jan. 24, 1903.

WANTED to Buy, Bronze and Gilded BRACKETS, CHANDELIERS, and SCONCES. Write, stating Price, to DUBRAY, 5, Rue Camusel, BRUSSELS.

WANTED, old Disused Gas-Meters, BRASS, COPPER, and LEAD ASHES for Cash.
J. SMITH, Broker, Canal Road, BRADFORD.

TO BE SOLD—Purifiers, Two or Four, 10 feet square by 4 ft. 6 in. deep, planed Joints, Connections, and Overhead Girders.
Write J. WRIGHT, 181, QUEEN VICTORIA STREET, E.C.

A BARGAIN—Water-Cooled Condenser in perfect condition. Capacity 250,000 cubic feet per 24 Hours.
Address A. E. LAYTON, Gas-Works, REDDITCH.

EXHAUSTER, with Engine combined, 8:00 to 15,000 cubic feet per hour, all Connections, by Tangye. In capital order. £90.
Address No. 3987, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

FOR SALE—Very good Gas Plant as under:—
PURIFIERS—Four, 12 feet square, with 8-inch Centre-Valve and Connections. Planed Joints.
Kirkham WASHER-SCRUBBER, 300,000 cubic feet per diem., with Engine and 8-inch Valves and Connections.
Livesey WASHER, 250,000 cubic feet per diem, with 8-inch Valves and Connections.
Photos. sent on application to SAML. WHILE AND SON, 60, Queen Victoria Street, LONDON, E.C.

THE Aberdare Gas Company have for SALE the IRONWORK belonging to a Bench of Five Beds of Six round Retorts each (removed to make room for Generator Beds). The goods may be seen at the Gas-Works; and TENDERS for them (not necessarily accepted) are invited, to be addressed to the Chairman on or before Tuesday, the 10th prox.
EVAN JONES,
General Manager and Secretary.

BOROUGH OF BARROW-IN-FURNESS.

THE Corporation are prepared to receive TENDERS for the supply of machine-moulded FIRE-CLAY RETORTS, FIRE-BRICKS, CAST-IRON PIPES, WROUGHT-IRON TUBES and FITTINGS, BRASS COCKS, GAS-METERS, GAS-COOKERS, and SULPHURIC ACID as may be required from the 1st day of April next to the 31st day of March, 1904.
Sealed Tenders, on Forms to be obtained at the office of the Manager of the Gas and Water Works, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Stores," to be delivered at the Town Clerk's Office on or before Tuesday, the 17th of February, 1903.
The lowest or any Tender not necessarily accepted.
By order,
C. F. PRESTON,
Town Clerk.
Town Hall, Barrow-in-Furness,
Jan. 30, 1903.

BOROUGH OF BARROW-IN-FURNESS.

THE Corporation are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Gas-Works from the 1st day of April next to the 31st day of March, 1904, delivered into the Purchasers' Tank-Waggons at the Gas-Works Siding.
Any further Information may be had on application to the Manager of the Gas-Works.
Sealed Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Tar," to be delivered at the Town Clerk's Office, on or before Tuesday, the 17th of February, 1903.
The highest or any Tender not necessarily accepted.
By order,
C. F. PRESTON,
Town Clerk.
Town Hall, Barrow-in-Furness,
Jan. 30, 1903.

TO GASHOLDER MAKERS.

THE Coventry Corporation Gas Committee invite TENDERS for the manufacture and erection of TWO FOUR-LIFT GASHOLDERS, with Guide-Framing, at their Foleshill Works.
Each Gasholder will be to the following dimensions: Inner Lift, 141 ft. 6 in. diameter; Second Lift, 144 ft. diameter; Third Lift 146 ft. 6 in. diameter; and Outer Lift, 149 ft. diameter—Three Lifts being 29 ft. deep, and one Lift 29 ft. 6 in. deep.
Specification, with Form of Tender and Schedule of Quantities, may be obtained on application to the undersigned, and prints of the Drawings will be supplied, if desired, upon payment of £1 1s., which will *not* be returned.
The Committee do not bind themselves to accept the lowest or any Tender.
Sealed Tender, addressed to the Chairman of the Gas Committee, Gas-Works, Coventry, and endorsed "Tender for Gasholders," must be delivered on or before Saturday, Feb. 14 next.
FLETCHER W. STEVENSON,
Engineer and General Manager.
Gas-Works, Coventry,
Jan. 23, 1903.

THE BRISTOL GAS COMPANY.

AMMONIACAL LIQUOR.

THE Directors invite Tenders for the purchase of the LIQUOR to be produced at their three Stations during a period of One, Three, Five, or Seven Years commencing on the 1st day of July, 1903.
The annual quantities and strengths of the Liquor produced at each of the Stations are approximately as under:—

Avon Street ..	1,600,000 galls.,	13½-ounce strength.
Canons' Marsh	1,500,000 "	13 " "
Stapleton ..	1,900,000 "	15 " "

Particulars, with Forms of Tender, may be obtained on application to the undersigned, to whom also Tenders, sealed and endorsed "Tender for Ammoniacal Liquor," must be delivered not later than Tuesday, the 24th day of February, 1903.
The Directors do not bind themselves to accept the highest or any Tender.
JOHN PHILLIPS,
Secretary.
Chief Offices: Canons' Marsh,
Bristol, Jan. 31, 1903.

BOROUGH OF NELSON.

SUPPLY OF GENERAL REQUIREMENTS, AND SALE OF SURPLUS TAR.

THE Gas Committee invite Tenders for the supply of the following Requirements during the Twelve Months ending the 1st of April, 1904.
(*a*) SULPHURIC ACID.
(*b*) LIME.
(*c*) IRONMONGERY.
(*d*) BRASS FITTINGS.
(*e*) CAST-IRON PIPES and SPECIALS.
The Committee also invite TENDERS for the purchase of the surplus TAR produced at their Nelson and Brierfield Works for the Twelve Months ending the 1st of April, 1904.
Form of Tender for each item, together with full Particulars, may be obtained on application to Mr. A. J. Hope, Engineer, Gas-Works, Nelson.
Sealed Tenders, duly endorsed, must be sent to the undersigned not later than Wednesday, the 18th of February.
J. H. BALDWICK,
Town Clerk.
Town Hall, Nelson, Lancs.,
Jan. 28, 1903.

THE Directors of the Henley-in-Arden Gas Company invite TENDERS for the supply and erection of a new GASHOLDER and TANK, about 12,000 cubic feet capacity, with 6-inch Connections.
Tenders to be delivered not later than Feb. 11, to JOHN W. LORD, Secretary.

ISLE OF THANET GAS COMPANY, MARGATE.

THE Directors of the above Company are prepared to receive TENDERS for the surplus TAR produced at their Works during the Twelve Months from Jan. 1 to Dec. 31, 1903.
Tenders to be addressed to the Chairman of the Company, endorsed "Tender for Tar," and must be delivered at the Offices of the Company, not later than the 12th of February next.
Further Particulars may be obtained on application to the Company's Engineer, Mr. James Dougall.
By order,
THOS. C. FULLER, F.C.I.S.,
Secretary.

COUNTY BOROUGH OF BOLTON.

THE Gas and Lighting Committee invite TENDERS for the supply of RETORTS and other FIRE-CLAY GOODS.
Further Particulars may be obtained on application to Mr. William Walch, Office Superintendent, Gas Offices, Bolton.
Sealed Tenders, endorsed "Fire-Clay Goods," and addressed to the Chairman of the Gas and Lighting Committee, Gas Offices, Bolton, to be delivered not later than Thursday, the 12th of February, 1903.
R. G. HINNELL,
Town Clerk.
Town Hall, Bolton,
Jan. 30, 1903.

STOCKTON-ON-TEES CORPORATION.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the GAS-MAINS, from 3 to 12 inches in diameter that may be required by this Department between now and the end of December, 1903.
Particulars, &c., may be had on application.
Tenders, sealed and endorsed "Tender for Gas-Mains," to be sent to the undersigned, not later than noon on the 24th day of February, 1903.
WM. FORD,
Manager.
Corporation Gas-Works,
Thompson Street,
Stockton-on-Tees, Jan. 31, 1903.

URBAN DISTRICT COUNCIL OF STOURBRIDGE.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply, delivery, and erection on their Gas-Works of a LIVESEY WASHER, to pass 2,000,000 cubic feet per day, complete with Valves and Connections to existing Mains.
Tenders to be addressed to the Chairman of the Gas Committee, endorsed "Washer," and sent to me at the Stourbridge Gas-Works not later than Tuesday, Feb. 10, 1903.
By order,
WM. NORTH,
Engineer and Manager.
Gas-Works, Stourbridge,
Jan. 20, 1903.

SILSDEN URBAN DISTRICT COUNCIL.

NEW GAS-WORKS.

THE above Council are prepared to receive TENDERS for the construction of a COMPLETE GAS-WORKS, to be erected at Silsden by the 30th of March, 1904. The Works have been designed for an Annual make of 12 Million cubic feet.
The Drawings and Specifications may be seen at the Town Hall, Silsden, and copies of the Specifications only may be obtained upon application to the undersigned, upon payment of One Guinea each, which will not be returned.
Tenders to be addressed to the Chairman of the Council on or before the 23rd day of February, 1903, endorsed "Gas-Works."
The Council do not bind themselves to accept the lowest or any Tender.
By order,
JOHN DRIVER,
Clerk.
Town Hall, Silsden,
near Keighley.

COMMERCIAL GAS COMPANY.

NOTICE is Hereby Given, that an ORDINARY MEETING of the Commercial Gas Company will be holden at the Cannon Street Hotel, in the City of London, on Thursday, the 19th of February, 1903, at Twelve o'clock at noon, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 31st of December, 1902, to declare a Dividend, to elect Directors and Auditors in place of those retiring, and to grant an allowance to the retiring Engineer.
The STOCK TRANSFER BOOKS WILL BE CLOSED from the 6th to the 19th of February next, both days inclusive, and the Dividends will be paid on the 2nd of March to the holders of Stock registered at the date of the closing.
Notice is Hereby also Given, that, in compliance with the Standing Orders of Parliament, a SPECIAL GENERAL MEETING of the said Company will be held at the same place, and on the same day, at a quarter after Twelve o'clock in the afternoon, for the purpose of submitting to the Proprietors at such meeting a proposed Bill in Parliament, to be intituled "A Bill to make Provision for the Testing of Gas supplied by the Commercial Gas Company and for other Purposes."
By order of the Board,
H. D. ELLIS,
Secretary.
Offices: Stepney,
Jan. 29, 1903.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Chief Offices, No. 639, High Road, Tottenham, on Saturday, the 21st day of February next, at Three o'clock in the afternoon precisely, to receive the Report of the Director and Statement of Accounts for the Half Year ended the 31st of December, 1902, to declare Dividends, and to transact such other Business as the Act of Parliament directs.

The TRANSFER BOOKS for the CONSOLIDATED "A" and "B" STOCKS WILL BE CLOSED from Friday, the 6th, to Monday, the 23rd of February, both days inclusive.

By order of the Board,
JAMES RANDALL,
Secretary.

Chief Offices of the Company:
639, High Road, Tottenham,
Jan. 30, 1903.

CRYSTAL PALACE DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Albion Tavern, Aldersgate Street, London, E.C., on Friday, the 13th day of February, 1903, at Three o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half-Year ended the 31st of December last, to declare a Dividend for the same period, to increase the remuneration of the Directors, to elect Two Directors and One Auditor in the place of those retiring by rotation, and for General Purposes.

Notice is Hereby Given, that an Extraordinary Meeting of the Proprietors of the Crystal Palace District Gas Company will be held at the Albion Tavern, Aldersgate Street, London, E.C., on Friday, the 13th day of February next, at 3.30 o'clock in the afternoon, or as soon thereafter as the business of the Ordinary Meeting of the Proprietors shall be concluded, for the purpose of considering the Provisions of the Bill now before Parliament, intituled "A Bill to confer Further Powers on the Crystal Palace District Gas Company with respect to the Purchase and Holding of Lands, and to alter the Provisions of the Acts of the Company with respect to the Illuminating Power and Purification of Gas supplied by the mand the Testing of Gas, and to change the Name of the Company, and for other Purposes."

At such Meeting the said Bill will be submitted for the consideration and approval of the Proprietors.

Dated this 30th day of January, 1903.

The TRANSFER BOOKS WILL BE CLOSED from the 30th day of January, until after the Meeting.

By order of the Board,
CHARLES M. OHREN,
Secretary.

Offices and Works:
Lower Sydenham, S.E.,
Jan. 30, 1903.

COLNEY HATCH GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, London, E.C., on Thursday, the 19th day of February next, at 3.45 o'clock p.m. precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 31st of December, 1902, to declare Dividends, to elect a Director, to appoint an Auditor, and for other purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 6th to the 19th of February next, both days inclusive.

By order,
ERNEST L. BURTON.
Secretary.

Secretary's Offices: 5, Great Winchester Street, Old Broad Street, London, E.C., Jan. 29, 1903.

LAMBETH WATER-WORKS COMPANY.

NOTICE is Hereby Given, that it is the intention of the Company to SELL BY TENDER such amount of THREE PER CENT. INTER-COMMUNICATION DEBENTURE STOCK as will produce (after deducting Expenses of Issue) £22,000 in cash, being the amount sanctioned by the Local Government Board under the Provisions of the Metropolis Water Act, 1899. The Stock will be redeemable at par at the option of the Company on Six Months' Notice at any time after the expiration of 25 Years from the date of issue.

Particulars, Conditions of Sale, and Forms of Tender may be obtained at the Company's Offices, Brixton Hill, S.W.

Sealed Tenders are to be delivered at the said Office not later than Twelve o'clock (noon) on Monday, the 16th of February, 1903.

By order,
H. WILKINS,
Secretary.

Brixton Hill, S.W.,
Dec. 9, 1902.

Now Ready. Price 5s. 6d. Post Free.

REPORTS OF DISTRICT GAS ASSOCIATIONS FOR 1902.

The publication of these Volumes commenced in 1883; and most of them are still on sale.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
ILFORD GAS COMPANY.

NEW ISSUE OF £6000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Feb. 17, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
HARROW AND STANMORE GAS COMPANY.

NEW ISSUE OF 300 £10 "C" SHARES.

MR. ALFRED RICHARDS will sell the ABOVE BY AUCTION at the Mart, E.C., on Tuesday, Feb. 17, at Two o'clock precisely, in lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTH ESSEX WATER-WORKS COMPANY.

NEW ISSUE OF £5000 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Feb. 17, at Two o'clock precisely, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

The Executors of Mrs. R. M. Cowland, and Others.
THE GAS-METER COMPANY, LIMITED,
22 £10 ORDINARY SHARES.
THE GOSPORT WATER-WORKS COMPANY,
£470 ORIGINAL STOCK, and £510 NEW ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Feb. 17, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
WEST HAM GAS COMPANY.

NEW ISSUE OF £19,100 OF FOUR PER CENT. PERPETUAL DEBENTURE STOCK,

Offering to Trustees and others an investment of the soundest character.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Wednesday, Feb. 18, at Two o'clock, in Lots.

Particulars of the SECRETARY OF THE COMPANY, at the Offices, Union Street, STRATFORD; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

LOWESTOFT WATER AND GAS COMPANY.

SALE BY AUCTION OF 400 ADDITIONAL ORDINARY £10 SHARES,

Ranking for 7 per cent., the Dividend on similar Shares in the Company having been 5¼ per cent. for several Years past; Also

£1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will SELL the above by AUCTION, at the MART, LONDON, E.C., on TUESDAY, Feb. 24, at Two o'clock, in Lots, by order of the Directors.

The Company, Incorporated in 1853, supply Water and Gas in Lowestoft and the surrounding district. The Water-Rental in 1891 was £7146; in 1901, it exceeded £13,500; and the Gas Consumption has advanced from 43 million cubic feet in 1891 to upwards of 70 millions in 1901. New Works to keep pace with the increasing demand for Water and Gas are necessary; and it is for these Works that the new Capital is being raised.

Particulars of Sale, and Form of Instructions for the Auctioneer or Secretary to purchase for Investors unable to attend the Auction, obtainable, post free, of the SECRETARY OF THE COMPANY, 137, London Road, LOWESTOFT, and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By Order of the Directors of the
SOUTH-WEST SUBURBAN WATER COMPANY.

NEW ISSUE OF £6250 FOUR PER CENT. IRREDEEMABLE DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Feb. 24, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C,

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£24,400

The above Stock will be entitled to Dividend from the 1st day of January, 1903, and be registered in the name of the Purchaser free of charge.

A Deposit of 10 per cent. will be required at the time of Sale; the remainder to be paid on or before the 28th day of February, 1903.

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MINIMUM PRICE £103 PER CENT.

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IN pursuance of the Tottenham and Edmonton Gas Act, 1898, Notice is Her by Given, that it is the intention of the Directors of this Company to SELL BY TENDER £7500 of the above DEBENTURE STOCK to be paid up in full on or before the 14th of March next, such Stock being a portion of Additional Capital authorized to be raised by Resolution passed at an Extraordinary General Meeting of the Proprietors held on the 24th day of February, 1900, under the Powers of the above-mentioned Act.

Particulars and Conditions and Form of Tender, may be obtained on application at this Office; and sealed Tenders must be sent in not later than Four o'clock in the afternoon of Saturday, the 28th of February, 1903.

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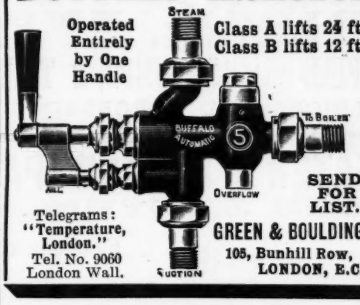

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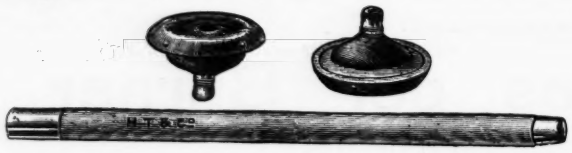

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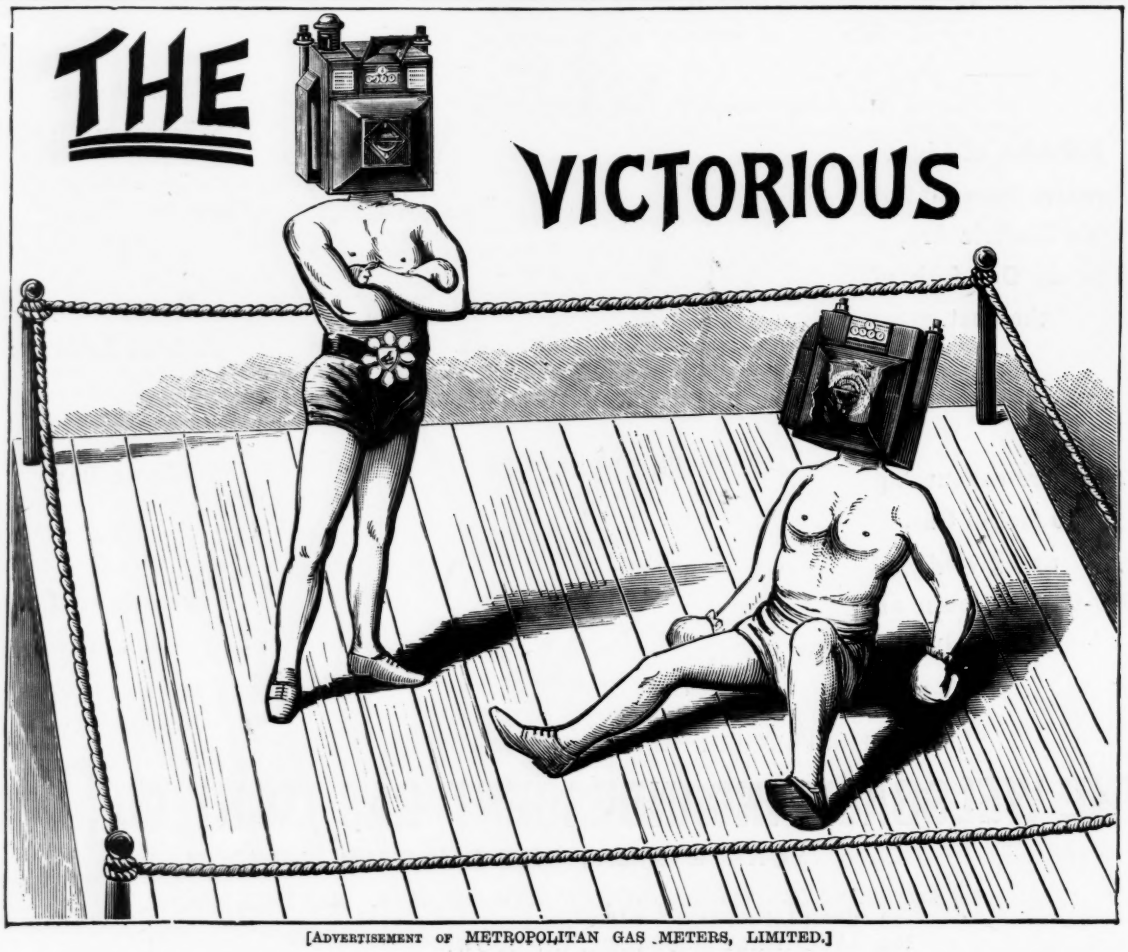

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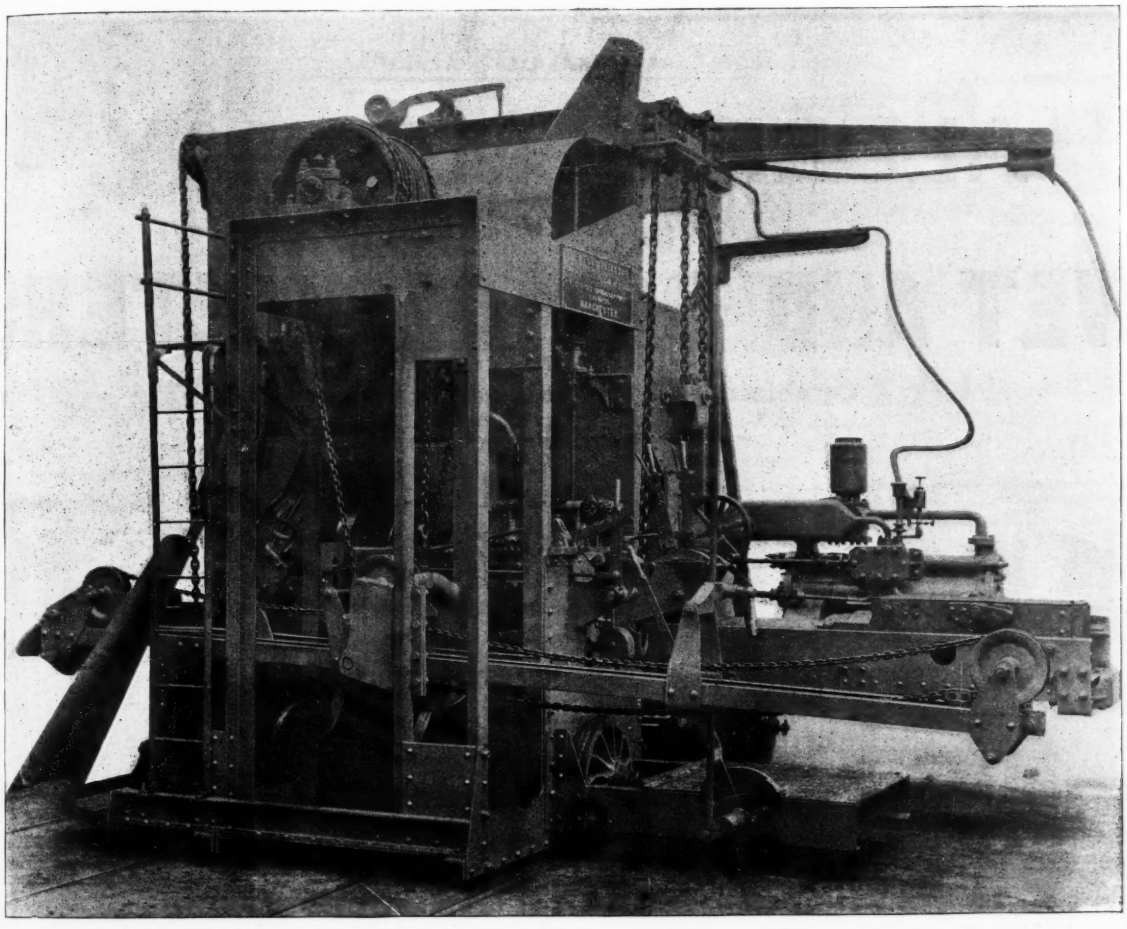

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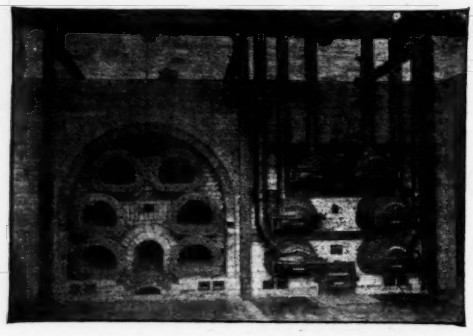

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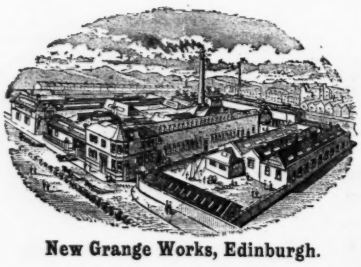

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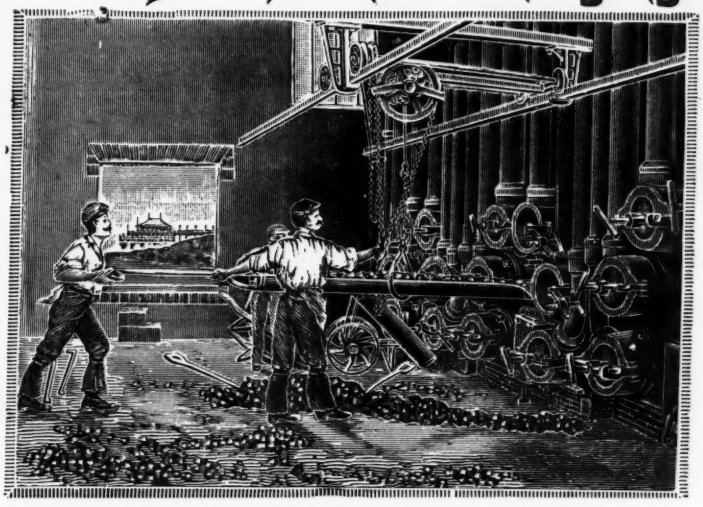

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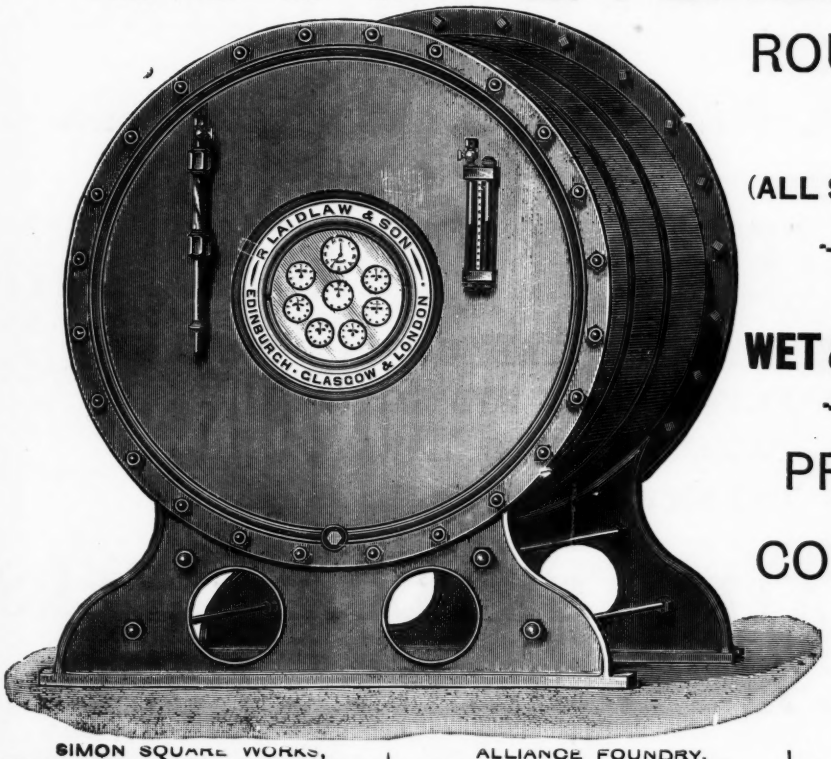

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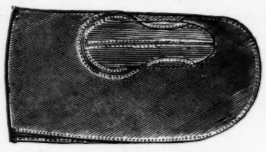

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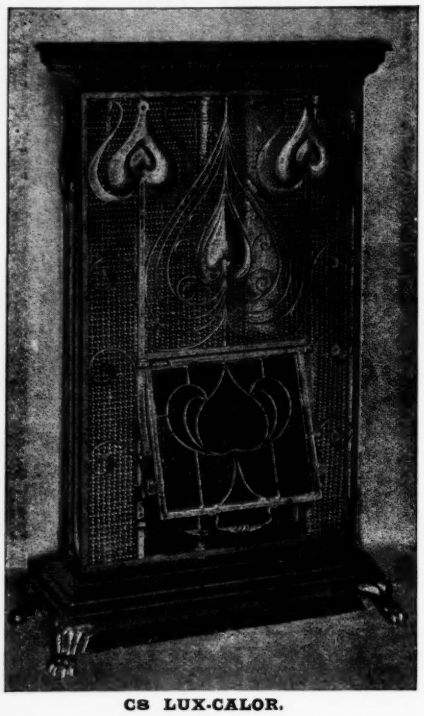

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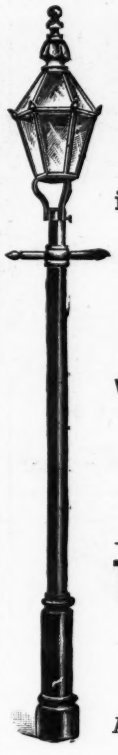

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